POPE of LNMS

M62 Junction 12 Eastbound Diverge Evaluation Report

January 2016

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Glossary

Term	a.k.a.	Definition
Accessibility	**-**	Accessibility can be defined as 'ease of reaching'. The accessibility objective is concerned with increasing the ability with which people in different locations, and with differing availability of transport, can reach different types of facility
Annual Average Daily Traffic	**AADT**	The 24 hour total traffic flow for the average day of the year
Appraisal Summary Table	**AST**	This records the impacts of the scheme according to the Government's five key objects for transport, as defined in **DfT** guidance contained on its **Transport Analysis Guidance** web pages, **WebTAG**
Asset Support Contractor	**ASC**	Responsible for the operation, maintenance, and improvement of the motorway and trunk road network of a Highways England area. First appointed in 2012, these replace **MAC**s
Automatic Traffic Count	**ATC**	An automated method of recording the volume (and sometimes classification) of vehicles passing a particular point on a road
Average Daily Traffic	**ADT**	The 24 hour total traffic flow on an average day over a certain time period (Monday – Sunday)
Average Weekday Traffic	**AWT**	The 24 hour total traffic flow on an average weekday over a certain time period (Monday – Friday)
Benefit Cost Ratio	**BCR**	Benefit Cost Ratio is a ratio identifying the relationship between cost and benefits of a proposed project
Capitalisation	**-**	The process by which benefits for a scheme are factored to give an estimate for the appropriate appraisal period
Department for Transport	**DfT**	A Government department whose objective is to oversee the delivery of a reliable, safe and secure transport system that responds efficiently to the needs of individuals and business whilst safeguarding our environment
Discounting	**-**	A technique used to compare costs and benefits that occur in different time periods and is the process of adjusting future cash flows to their present values to reflect the time value of money, e.g. £1 worth of benefits now is worth more than £1 in the future. A standard base year needs to be used which is 2002 for the appraisal used in this report
Dis-benefit	**-**	A negative benefit or something that detracts from the performance

Evaluation Summary Table	**EST**	In **POPE** studies, this is a summary of the evaluations of the **TAG** objectives using a similar format to the forecasts in the **AST**
First Year Rate of Return	**FYRR**	First Year Rate of Return is the ratio of money gained on an investment relative to the amount of money invested
Highways England	**-**	An Government-owned company**,** responsible for operating, maintaining and improving the strategic road network in England
Killed or Seriously Injured	**KSI**	A term used to describe the number of people killed or seriously injured as a result of **PIC**s
Local Network Management Scheme	**LNMS**	LNMS are improvement schemes where total overall estimated cost (including design, land, works, supervision, risk and VAT) is less than £10 million. They are categorised by the Government under Safety, Economy, Severance, Environment, Non-Appraisable and Non-NATA
Managing Agent Contractor	**MAC**	Responsible for the operation, maintenance, and improvement of the motorway and trunk road network of a Highways England area. These are being replaced by **ASC**s, the first of which was appointed in 2012
New Approach to Appraisal	**NATA**	Used for transport scheme appraisal since 1998. More recently, this has been superseded by **WebTAG**.
Optimism Bias	**-**	Is a demonstrated systematic, tendency for project appraisers to be overly optimistic, and in effect, results in an underestimation of scheme costs. The base cost estimate is adjusted to account for optimism bias in order to obtain more accurate cost estimates
Project Appraisal Report	**PAR**	A key document summarising the need for a project, plus its costs and benefits (including those that cannot be quantified in monetary terms)
Personal Injury Collison	**PIC**	A term commonly used to refer to road accidents
Post-Opening Project Evaluation	**POPE**	Before and after monitoring of all highway schemes in England
Present Value of Costs	**PVC**	Present Value of Costs is a term used in cost-benefit analysis and project appraisal that refers to the discounted sum, or Present Value, of a stream of costs associated with a project or proposal
Risk Allowance	**-**	**Risk** refers to identifiable future situations that could result in an over spend or under spend occurring. The base cost estimate is adjusted to account for risk in order to obtain more accurate cost estimates
Severance	**-**	Community severance is the separation of adjacent areas by road or heavy traffic, causing negative impact on non-motorised users, particularly pedestrians

-	**STATS19**	A database of injury accident statistics recorded by police officers attending accidents
Traffic Database System	**TRADS**	Traffic count database developed by Highways England, to hold data from traffic monitoring sites on the strategic network
Web-based Transport Analysis Guidance	**WebTAG**	The Department for Transport's transport appraisal guidance and toolkit, first issued in 2003

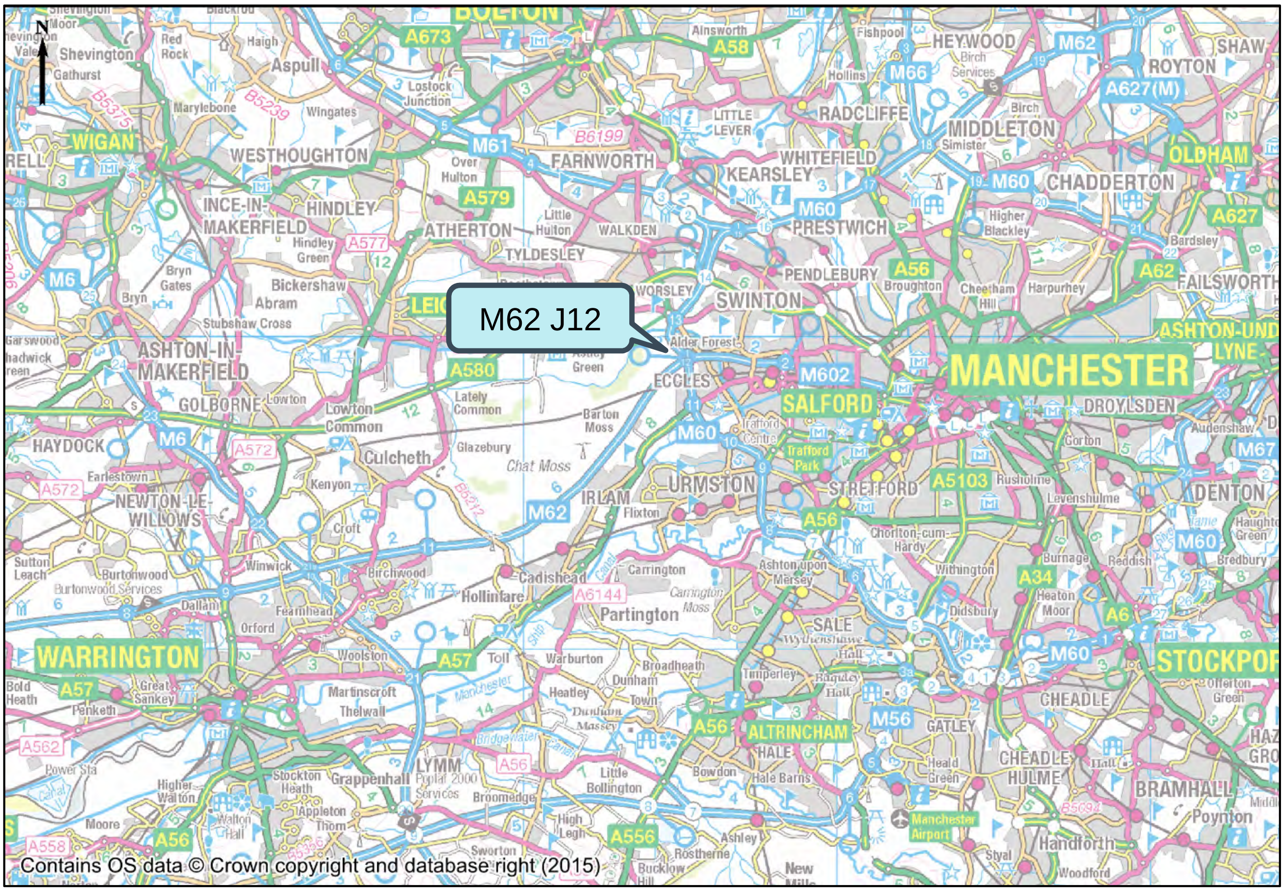
1. Introduction

Background

1.1. This report is the Post-Opening Project Evaluation (POPE) of the **M62 J12 Eastbound Diverge** Local Network Management Scheme (LNMS), produced by Atkins on behalf of Highways England.

1.2. M62 Junction 12 is situated to the west of Manchester and forms an interchange between the M62 to the west, the M60 Manchester Outer Ring Road to the north and south, and the M602 to the east. The location of the junction is indicated in **Figure 1.1**.

Figure 1.1 – Location Plan



1.3. As shown in **Figure 1.2**, the junction is arranged as a 'whirlpool' grade-separated interchange, with each of the four motorway arms connected by free-flowing carriageways and slip-roads.

1.4. The scheme was developed to address extensive queuing on the M62 eastbound approach to the junction, caused by traffic bound for the clockwise M60. Furthermore, there was a safety issue associated with the junction, with 45 Personal Injury Collisions (PICs) recorded in the PAR during a five-year period prior to the scheme. Late swooping movements were observed where a lane was dropped at the eastbound diverge, and a large number of shunt-type and lane change accidents were recorded.

Figure 1.2 – Local Location Plan

Purpose of this report

1.5. As part of an ongoing programme, whereby Highways England (formerly the Highways Agency) evaluates the impacts of trunk road schemes, Atkins is commissioned to undertake post-opening evaluations of LNMS with an implementation cost of less than £10m.

1.6. This report sets out the results of the POPE of the M62 J12 Eastbound Diverge LNMS. More specifically, this report examines the economic and safety impacts resulting from the improvements, with consideration also given to a range of other impacts on the environment and society.

1.7. Because of roadworks taking place between July 2014 and late 2017 to upgrade the M60 through the junction to a Smart Motorway, a temporary speed limit is imposed on each of the motorways through the junction, and the behaviour of traffic is not expected to be typical. As a result, the post-scheme analysis in this report is focused on the period before July 2014.

1.8. It is intended that the findings from this report will feed into a wider summary of the outcomes of POPE. This is a document (namely the LNMS Annual Evaluation Report) produced in the 4th quarter of each year outlining the key messages from the entire POPE of LNMS process.

2. Scheme Detail

Introduction

2.1. This section of the report outlines the pre-scheme and post-scheme layout of the scheme area, using photos, diagrams and site observations to illustrate the changes made to the highway network. In addition, this section contains the views and feedback on the scheme from key stakeholders.

Background

2.2. As part of the M62 J12 Eastbound Diverge LNMS, the length of the fourth lane on the junction approach was extended, and the diverge was reconfigured to provide separate lanes for traffic heading for the northbound and southbound carriageways of the M60. The CCTV monitoring of the inside lane was improved to ensure safety in the event of breakdowns.

2.3. **Table 2.1** summarises the scheme details.

Table 2.1 – Summary of M62 J12 Eastbound Diverge LNMS

Scheme name	M62 J12 Eastbound Diverge
Area	10
Opening date	September 2011
Category	Economy
Reason for scheme	The scheme was developed to address issues with extensive queuing on the M62 eastbound approach to J12, where queuing traffic heading for the M60 clockwise affected the otherwise free-flowing traffic for the M60 anti-clockwise and the M602. The junction also had a safety issue. The PAR noted that 45 Personal Injury Collisions (PICs) were recorded in five years before the scheme implementation, including a large number of shunt-type and lane change accidents. It also highlighted the observation of late swooping movements where there was a lane drop at the diverge point.
Objectives	To reduce congestion and travel times. To reduce the number of injury accidents, and to reduce possible conflicts.
Alternative options	None considered.

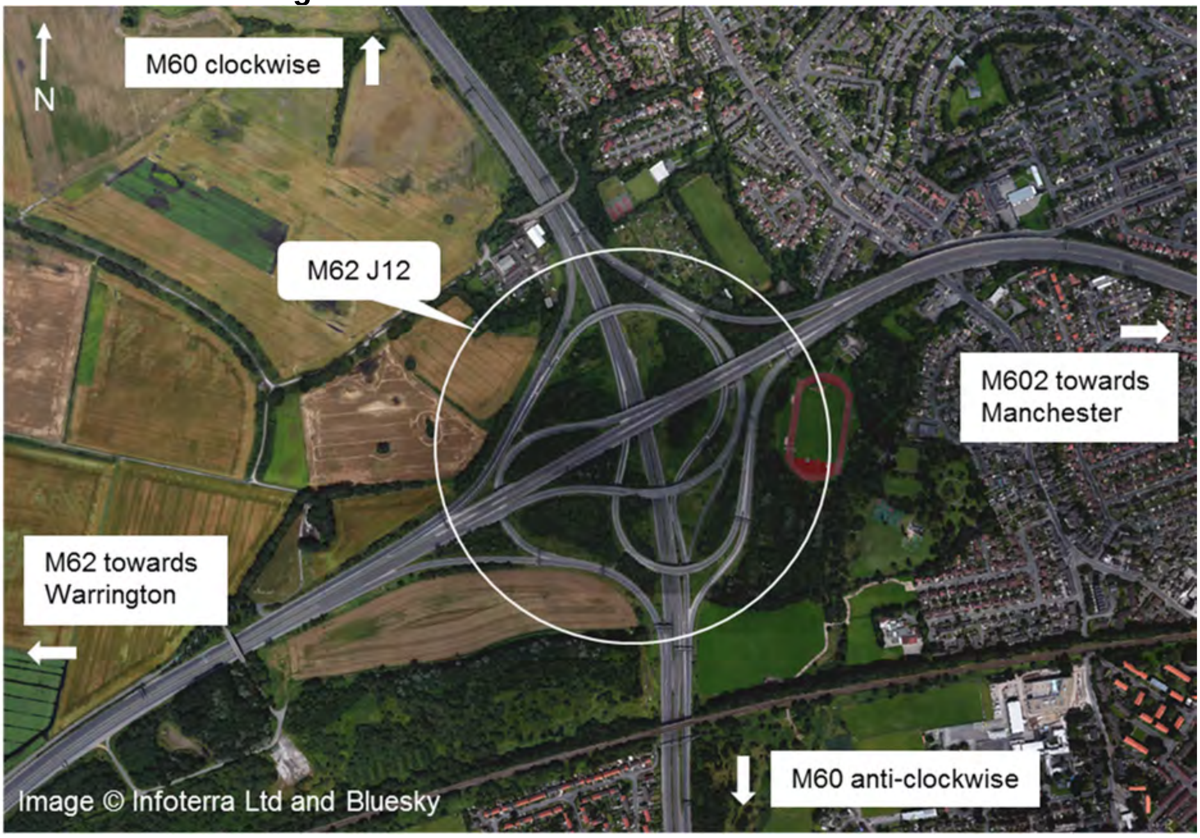
Location

2.4. The scheme is located at M62 Junction 12, known as Eccles Interchange. The M62 at this point is of dual three lane motorway standard, and becomes the M602 as it passes over the M60 to the east. The junction consists of a ‘whirlpool’ grade-separated interchange connecting the M62/M602 to the M60 along free-flowing slip-roads. There is no access to non-motorway roads.

2.5. The scheme affects the eastbound diverge of the M62, where traffic heading eastbound along the M62 splits between the M602 ahead and a slip-road to the left, which in turn divides to lead to the M60 clockwise and anti-clockwise carriageways.

2.6. **Figure 2.1** indicates the local context of the junction.

Figure 2.1 – Junction Location Context Plan



Pre-Scheme Junction Layout

2.7. Prior to the scheme, the interchange was arranged as shown in **Figure 2.2** and **Figure 2.3**. For clarity, a simplified schematic of the pre-scheme layout of the diverge follows in **Figure 2.4**.

2.8. The three-lane M62 eastbound carriageway widened to four lanes approximately 560 metres in advance of the point where the slip-road for the M60 clockwise and anti-clockwise diverged from the eastbound M62.

2.9. At the diverge point, the nearside two lanes diverged as a lane drop, and the remaining two offside lanes continued ahead to the M602.

2.10. The two dropped lanes formed a slip-road. One lane then diverged to the right from the offside lane to lead to the M60 anti-clockwise, and the two lanes continued ahead to the M60 clockwise.

Figure 2.2 – Pre-Scheme Junction Approach Layout

Figure 2.3 – Pre-Scheme Junction Layout

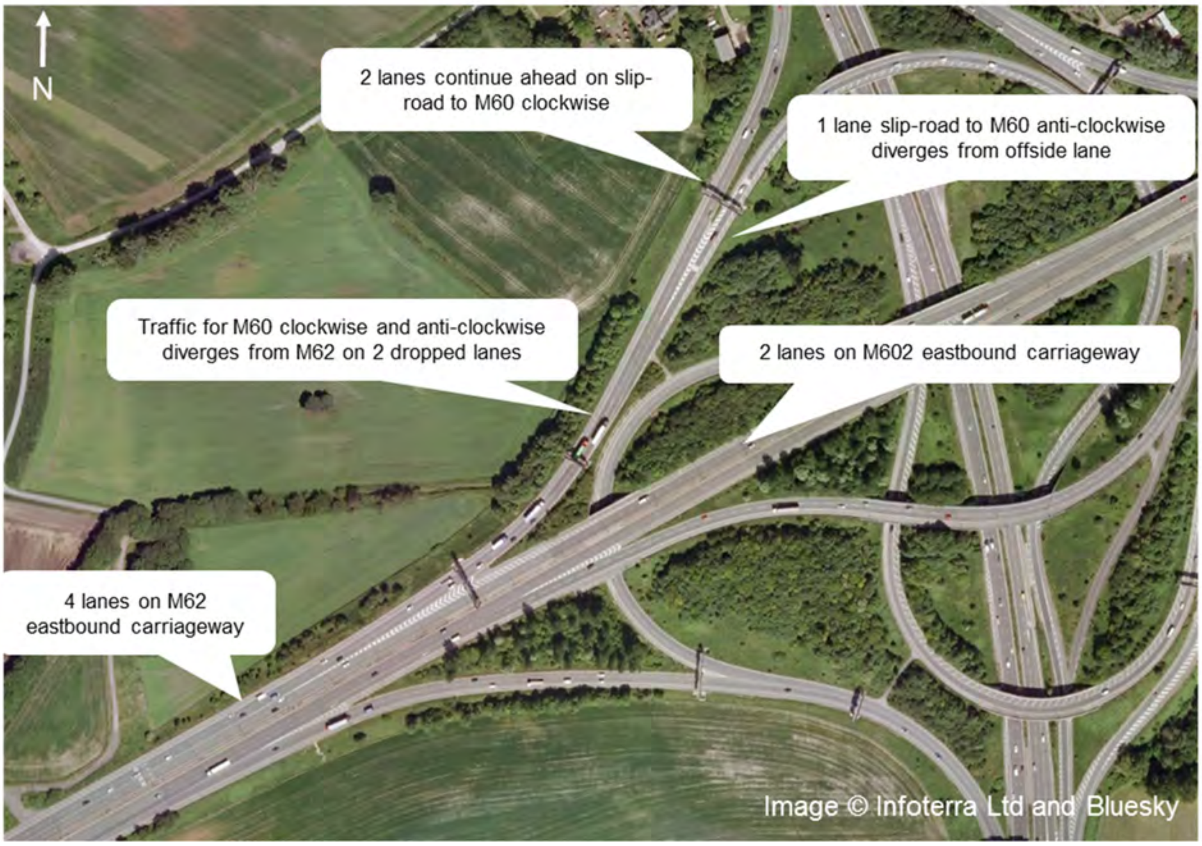
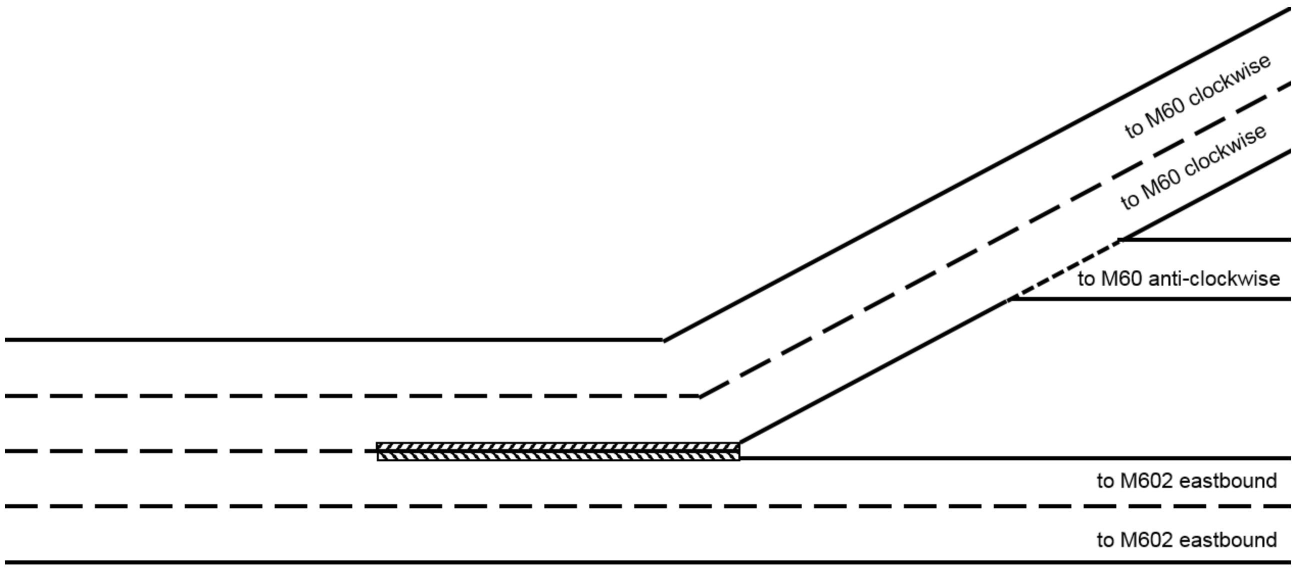


Figure 2.4 – Pre-Scheme Schematic Layout (Not to Scale)



2.11. Gantry signs indicated the required lanes from approximately 1,100m in advance of the diverge point from the mainline M62, and lane markings indicated the lane destinations at the junction from around 600m in advance of the diverge.

2.12. With this layout, the PAR states there was extensive queuing on the M62 on approach to J12, where traffic queuing for the M60 clockwise affected the otherwise free-flowing M60 anti-clockwise and M602 traffic.

Post-Scheme Junction Layout

2.13. Details of the new junction layout introduced as part of the scheme are shown in **Figure 2.5** and **Figure 2.6.** For clarity, a simplified schematic of the post-scheme layout of the diverge follows in **Figure 2.7**.

2.14. The four-lane eastbound approach to the junction has been extended to 2.4km in advance of the diverge. This has been achieved by converting the hard shoulder into a running lane.

2.15. A first decision point occurs approximately 300m before the diverge point, when the nearside two lanes become segregated from the remaining two by ‘tiger tail’ road markings to prohibit traffic from crossing between the two flows. At the diverge point, these lanes diverge as a lane drop, and continue on a slip-road to merge with the M60 clockwise.

2.16. For traffic remaining in the offside two lanes, a second decision point occurs at the diverge point. Here, a further lane, for the M60 anti-clockwise, diverges on to the slip-road from the nearside of the two remaining lanes on the M62 eastbound. This lane continues to be separated from traffic for the M60 clockwise by ‘tiger tail’ markings. The two remaining offside two lanes on the M62 eastbound continue ahead to form the M602.

2.17. The increase of lanes from two to three on the slip-road following the diverge from the M62 is achieved by taking space from the existing hard shoulder.

Figure 2.5 – Post-Scheme Junction Layout

Figure 2.6 – Post-Scheme Junction Layout

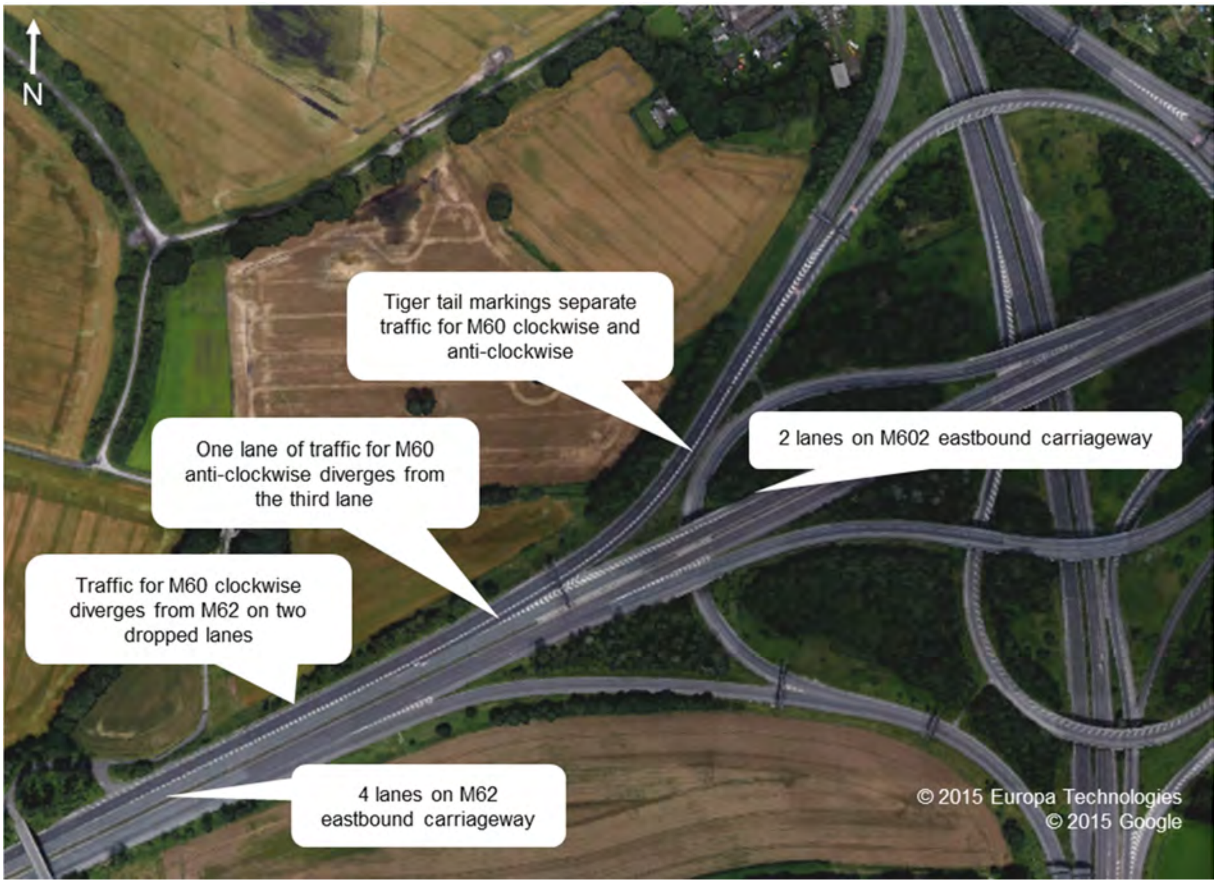
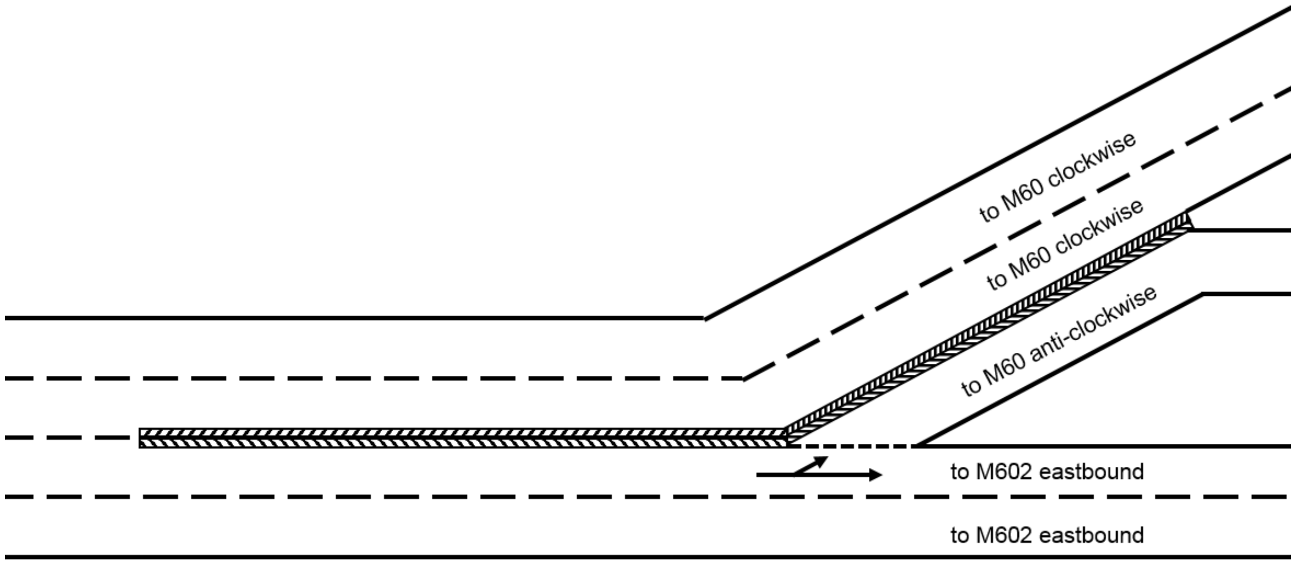


Figure 2.7 – Post-Scheme Schematic Layout (Not to Scale)



2.18. As stretches of hard shoulder have been removed, the PAR also indicated that CCTV monitoring of the nearside lane along the stretch of the scheme would be improved to ensure safety in the event of breakdowns in the live lane.

2.19. Gantry signs indicate the lane designations from approximately 1,700m in advance of the diverge point from the mainline M62, and lane markings indicate the lane destinations at the junction from around 1,000m in advance of the diverge.

2.20. A comparison of pre- and post-scheme street level imagery of key locations in the scheme area is presented in **Table 2.2**. To avoid the inclusion of signage associated with the M60 Smart Motorway works, post-scheme imagery taken before July 2014 is used.

Table 2.2 – Comparison of Pre- and Post-Scheme Views

	Pre-scheme	Post-scheme
A		
B		
C		
D		

Post-Scheme Site Observations

2.21. A site visit was undertaken during the PM peak, from 16:15 to 17:45 on Monday 29th June 2015. The observers passed through the M62 J12 Eastbound Diverge three times during that period. The weather was warm and dry with sunny intervals.

2.22. For two reasons, it is not believed that typical behaviour was observed at the site. Firstly, at approximately 16:15 a crash occurred on the eastbound M62 east of J11, involving three vehicles. The whole eastbound carriageway was closed on two short occasions within the period from 16:15 to 17:30 as the accident was dealt with, and at other times only a limited number of lanes were in use at the crash site. The incident resulted in significant congestion west of the accident, which held traffic back from reaching J12 and is likely to have reduced the peak volume of traffic arriving at J12. Secondly, the M60 through J12 is subject to ongoing works to upgrade it to a Smart Motorway, and consequently a 50mph speed limit is being enforced on both the M60 and M62 through the junction.

2.23. All of the scheme elements were seen to be in place and operational. Some roadside signs were partially obscured by foliage, but signage was otherwise clearly visible. The road markings were also clearly visible, although some text markings were beginning to fade as a result of the scheme having been in situ for over three years and the high level of traffic which uses the area. Gantry signing and lane markings indicating the correct lane to use were visible in good time, although there were a large number of signs related to the M60 roadworks that added clutter to the approach to the junction. The road markings and roadworks signage can be seen in **Figure 2.8**.

2.24. Generally, traffic operations at the junction appeared to function well. The two offside lanes, for the M602 and M60 anti-clockwise, moved consistently at 40-50 mph each time the observers passed the junction. The link road to the M60 anti-clockwise was similarly free-flowing. At 16:30, traffic on the two nearside lanes, for the M60 clockwise, was observed crawling slowly for approximately 1km in advance of the J12 diverge, as shown in **Figure 2.9**, but this had cleared to 40-50mph by 17:05. These observations must be taken with caution bearing in mind the upstream accident referred to above.

2.25. It was considered that vehicles moved into the correct lane for the junction in good time. Only one late manoeuvre was observed: a car approached the junction in lane 2, and then crossed the ‘tiger tail’ markings to reach the link road to the M60 anti-clockwise, shortly after the latter diverged from the mainline M602.

Figure 2.8 – Roadworks Signage on the M62 J12 Eastbound Approach

Figure 2.9 – Queuing on Nearside Two Lanes on M62 J12 Eastbound Approach

Stakeholder Feedback

2.26. While the analysis in this report can consider the quantifiable impact of this scheme based on empirical data, it is also worth considering the opinions of major stakeholders of the scheme. For example, a scheme may save journey times in practice, but if this saving isn't perceived, the scheme may not be as successful as first thought.

2.27. The major stakeholders contacted for feedback on the M62 J12 Eastbound Diverge Scheme were representatives of the current Asset Support Contractor (ASC) and the former Managing Agent Contractor (MAC) for Area 10. The MAC was A-one+ at the time of submission of the PAR, and the ASC is Balfour Beatty Mott MacDonald at the time of evaluation.

2.28. No response was received from either of the representatives contacted.

3. Traffic Volumes

Introduction

3.1. This section of the report considers the impact that the M62 J12 Eastbound Diverge Large LNMS has had on traffic volumes.

Data Source

3.2. As scheme planning and construction is a process that takes a number of years, it is important to understand how traffic volumes have changed over time and whether this will impact the way the scheme performs. To understand this, continuously-collected ATC data from Highways England's TRADS database has been assessed.

3.3. Data was obtained for the years 2008 – 2014 for the following locations:

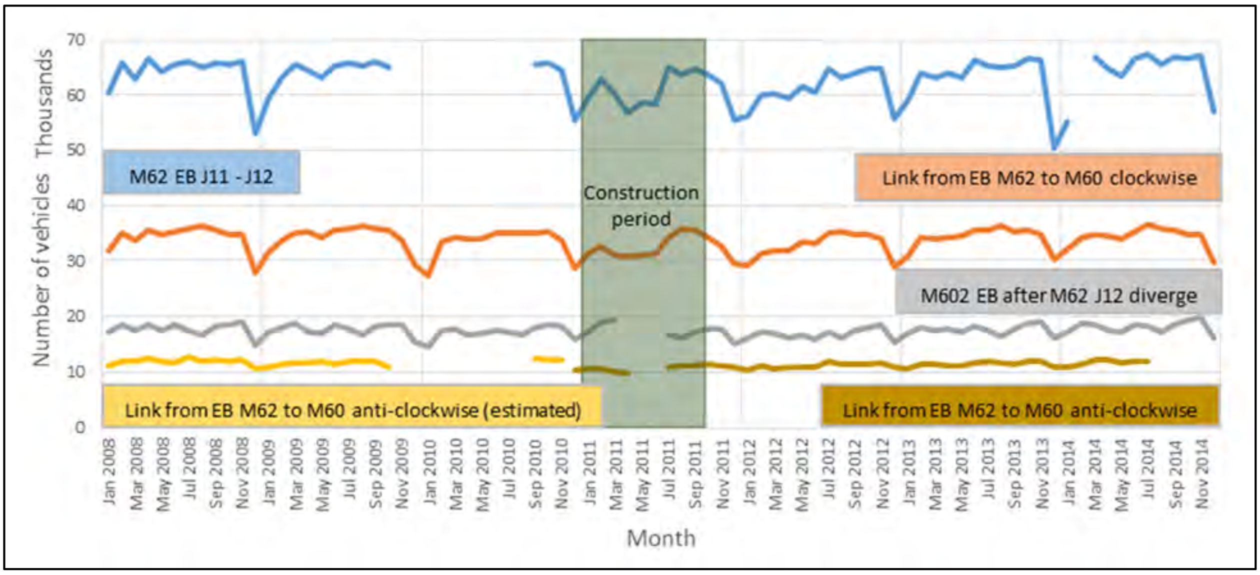
- M62 eastbound between J11 and J12;
- M602 eastbound within J12;
- Link road from M62 J12 eastbound to M60 J12 anti-clockwise;
- Link road from M62 J12 eastbound to M60 J12 clockwise; and
- M60 clockwise between J12 and J13.

Traffic Volume

M62 Eastbound Mainline and Link Roads

3.4. TRADS count sites have been analysed on the eastbound M62 between J11 and J12, on the eastbound M62 after the diverge at J12, and on the two link roads after the diverge at J12. The Average Weekday Traffic (AWT) on a monthly basis is shown in **Figure 3.1**. In the absence of direct data, the AWT before December 2010 for the link from the eastbound M62 to the anti-clockwise M60 has been estimated from the difference between other count sites.

Figure 3.1 – Monthly AWT on the eastbound M62



3.5. The data shows that traffic flow patterns have remained relatively consistent before and after the implementation of the scheme. There is also little difference in 2013 and 2014 compared to 2012, suggesting there has been no significant traffic growth in the period since the scheme opened.

3.6. The chart indicates that, in general, over 50% of traffic arriving at M62 J12 from the west is heading to the M60 clockwise. The proportion of arriving traffic continuing ahead to the M602 is approximately 30%, and the remaining traffic continues to the M60 anti-clockwise. These proportions remain relatively constant throughout the year.

3.7. The post-scheme lane allocations at the diverge reflect these proportions, as the busiest movement now has two exclusive lanes, while the second busiest shares one of its two approach lanes with the least-used movement.

3.8. Vehicle flow on the mainline through the junction is shown to experience seasonal variation with traffic relatively constant through spring to autumn, but with a reduction each winter. Lower traffic levels through winter are considered typical across the highway network as wintery bad weather tends to reduce the traffic on the network.

3.9. No discernible increase in mainline M62 flow since 2008 is evident from the graph. To understand how this compares to the national traffic growth, **Table 3.1** presents DfT statistics on Great British road traffic on motorways between 2008 Q1 and 2014 Q4, adjusted for seasonality.

Table 3.1 – Changes in Average Annual Traffic on Motorways since 2008 Q1

Period		Variation from 2008 Q1 (billion vehicle miles)	% change from 2008 Q1
2008	Q2	-0.5	-3.1%
	Q3	-0.7	-4.4%
	Q4	-0.6	-3.8%
2009	Q1	-0.6	-3.8%
	Q2	-0.4	-2.5%
	Q3	-0.5	-3.1%
	Q4	-0.7	-4.4%
2010	Q1	-0.8	-5.0%
	Q2	-0.6	-3.8%
	Q3	-0.6	-3.8%
	Q4	-0.9	-5.6%
2011	Q1	-0.5	-3.1%
	Q2	-0.6	-3.8%
	Q3	-0.6	-3.8%
	Q4	-0.4	-2.5%
2012	Q1	-0.4	-2.5%
	Q2	-0.5	-3.1%
	Q3	-0.4	-2.5%
	Q4	-0.3	-1.9%
2013	Q1	-0.4	-2.5%
	Q2	-0.1	-0.6%
	Q3	-0.1	-0.6%
	Q4	-0.1	-0.6%
2014	Q1	0	0.0%
	Q2	0	0.0%
	Q3	0.2	1.3%
	Q4	0.1	0.6%

3.10. **Figure 3.1** indicates that there has been no large change in traffic flows on the eastbound M62 near the scheme, while **Table 3.2** provides evidence to suggest that traffic through the scheme area has slightly decreased over the period that the scheme has been developed and opened. This small change, of less than 5% for each movement through the junction, is not sufficient to conclude that the M62 EB diverge scheme has had any effect on traffic levels.

Table 3.2 – Pre & Post-Scheme Change in M62 EB Average Daily Traffic through J12

Period	M62 EB J11-J12 ADT	M62 EB to M602 EB ADT	M62 EB to M60 Clockwise ADT	M62 EB to M60 Anti-clockwise ADT *	M60 Clockwise J12-J13 ADT
November 2008 – October 2009	57,345	31,488	15,446	10,411	95,722
January 2012 – December 2012	54,969	29,911	14,706	10,352	93,587
Difference	-2,376	-1,577	-740	-59	-2,135
% change before and after scheme	-4.1%	-5.0%	-4.8%	-0.6%	-2.2%

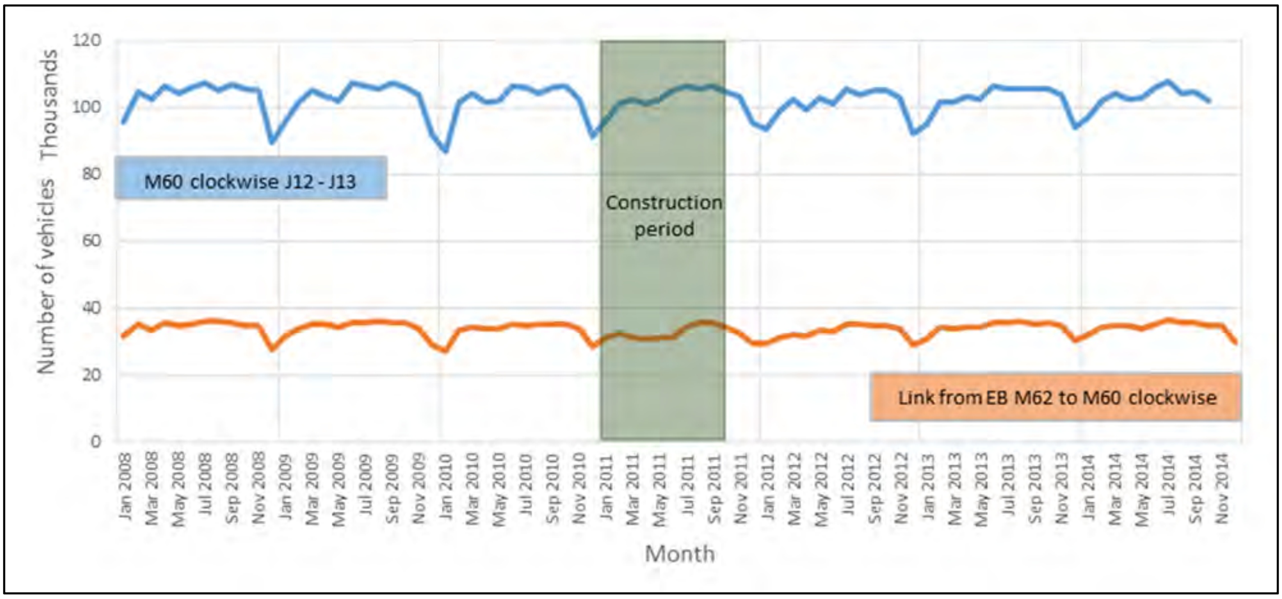
** estimated from the difference between the other sites*

M60 Clockwise

3.11. The PAR mentioned that traffic through the M62 J12 Eastbound Diverge was affected by queuing for the M60 clockwise. This is likely to be the result of traffic on the slip-road from the eastbound M62 experiencing difficulty merging with the M60 clockwise, which could be caused by high traffic volumes on the M60. To determine whether any post-scheme benefits to traffic at the M62 Eastbound Diverge are the result of changes in flow on the M60 Clockwise, it is therefore also beneficial to consider the traffic flow profile for the M60 clockwise between Junctions 12 and 13, immediately downstream of J12. This is the combination of traffic merging from the M62 eastbound, and the competing traffic on the M60.

3.12. Highways England TRADS data for this location has been interrogated for the period 2008 – 2014 to produce the monthly AWT graph shown in **Figure 3.2**.

Figure 3.2 – Monthly AWT on the clockwise M60



3.13. As on the M62 Eastbound, this data shows that traffic flow patterns have remained relatively consistent before and after the implementation of the scheme. There is also little difference in 2013 and 2014 compared to 2012, suggesting there has been no large traffic growth in the period since the scheme opened. The M60 clockwise displays similar seasonal variation to the M62 eastbound at Junction 12. The final column of **Table 3.2** indicates that traffic on this section of road has, slightly decreased over the period of the scheme's development and opening.

3.14. The chart indicates that the AWT on the M60 clockwise between J12 and J13 for each month is generally between 90,000 and 110,000, demonstrating that the road is heavily utilised at this location. Around 30% of this traffic joined at J12 from the M62 J12 eastbound. This large volume of traffic joining the motorway at a single location is a likely cause of delays on the slip-road from the eastbound M62 and through the M62 J12 Eastbound Diverge.

Daily Traffic Patterns

3.15. By studying the daily traffic patterns, it is possible to identify peak periods during which the junction is subject to high demand. This will help to understand journey times around the junction and when delays might be expected.

M62 Eastbound Mainline and Link Roads

3.16. The Highways England TRADS sites located on the motorway mainline and slip-roads have been interrogated for the period January – December 2012 to gain an appreciation of the daily flow profile of traffic using the diverge (shown in **Figure 3.3**).

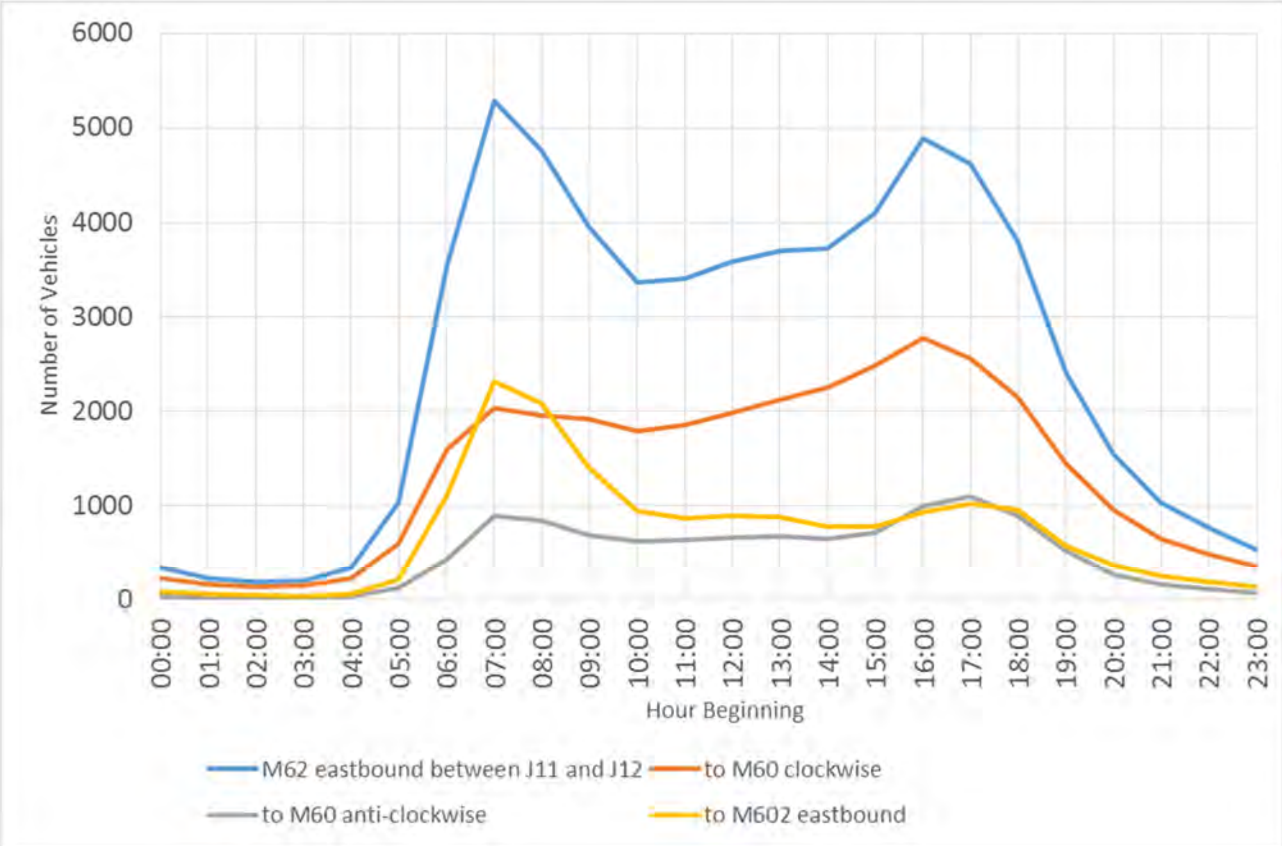
3.17. In summary:

- **AM peak traffic approaching the junction was experienced between 07:00 and 09:00** – The data demonstrates that the peak traffic at Junction 12 occurred across a two hour period, during which time an average of more than 10,000 vehicles travelled through the M62 Eastbound Diverge. The movement to the M602 eastbound (in the direction of Salford and Manchester City Centre) carried the highest traffic flows, with the flow to the M60 clockwise being only slightly lower. Together these two movements account for over 80% of trips at this time, with less than 20% using the diverge slip-road to access the anti-clockwise M60 carriageway;
- **PM peak traffic approaching the junction was experienced between 16:00 and 18:00** – A PM peak is observed across two hours with the movement to the clockwise M60 being the clearly dominant flow. The number of vehicles that used the slip-road to join the M60 anti-clockwise carriageway was similar to the number that continued ahead through to the M602 eastbound;
- **The junction was at its busiest during the AM peak** – There were around 400 more vehicles using the junction between 07:00 and 08:00 than between 16:00 and 17:00;
- **The movement to the M60 clockwise dominated at all times other than the AM peak** – In each hour outside the period from 07:00 to 10:00, over half of all vehicles arriving at Junction 12 from the M62 eastbound made this movement. The flow using this movement is relatively constant from 07:00 to

12:00, then rises gradually to reach the PM peak, with over 2,700 vehicles making this movement between 16:00 and 17:00;

- **The ahead movement to the M602 eastbound carried over twice as much traffic in the AM peak than the PM peak** – Although this movement was the heaviest used during the AM peak, it tailed off to around 1,000 vehicles per hour by 10:00 and remained relatively constant through the interpeak and PM peak. This is consistent with a tidal commuter flow to central Manchester; and
- **The PM peak hour for traffic heading to the M60 anti-clockwise and to the M602 eastbound occurred later than the PM peak hour for traffic heading to the M60 clockwise** – While the traffic heading to the M60 clockwise experienced a PM peak volume during the hour from 16:00 to 17:00, the other two movements considered experienced a less pronounced, more spread out PM peak, with their peak hour from 17:00 to 18:00.

Figure 3.3 – Average Weekday Hourly Traffic Flow into the Junction (2012)



3.18. Daily profile information for Saturdays and Sundays is shown in **Figure 3.4** and **Figure 3.5**.

3.19. The peak hour was between 13:00 and 14:00 on Saturdays, and between 12:00 and 13:00 on Sundays, when the heaviest traffic flows approaching junction 12 were observed. In both cases, over half of vehicles approaching along the M62 eastbound were destined for the M60 clockwise, with the remaining traffic evenly balanced between using the M60 anti-clockwise slip-road and the M602 eastbound through the junction. These weekend peak flows were of a similar level to the weekday interpeak period.

Figure 3.4 – Average Saturday Hourly Traffic Flow into the Junction (2012)

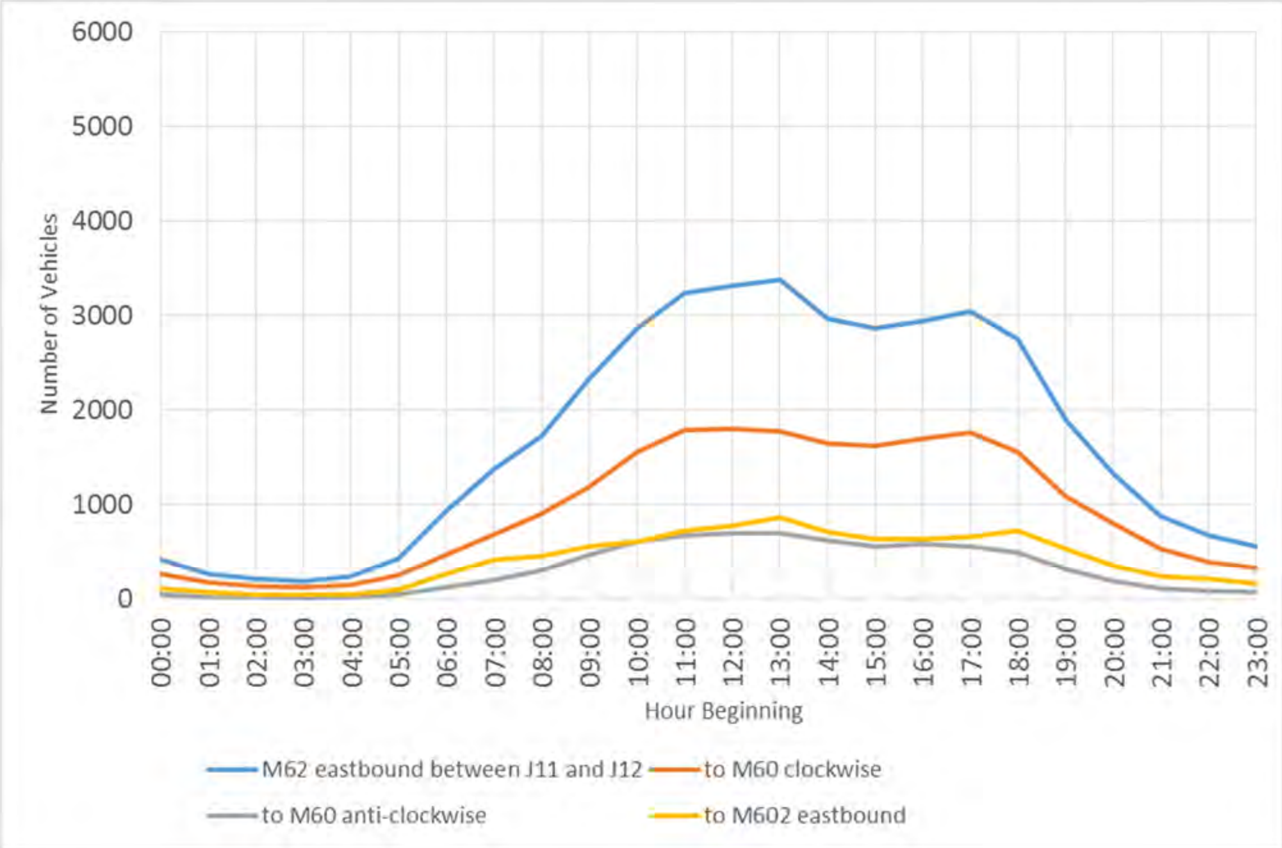
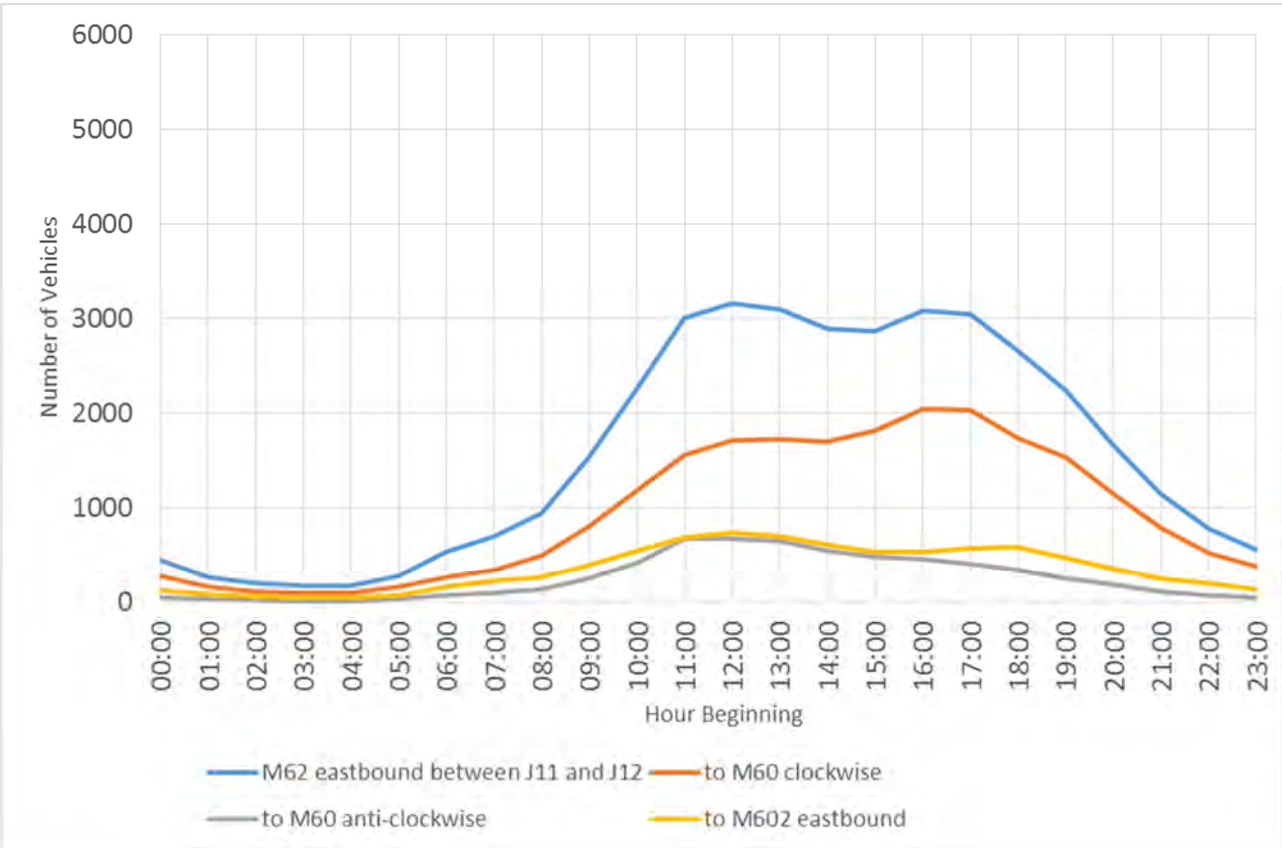


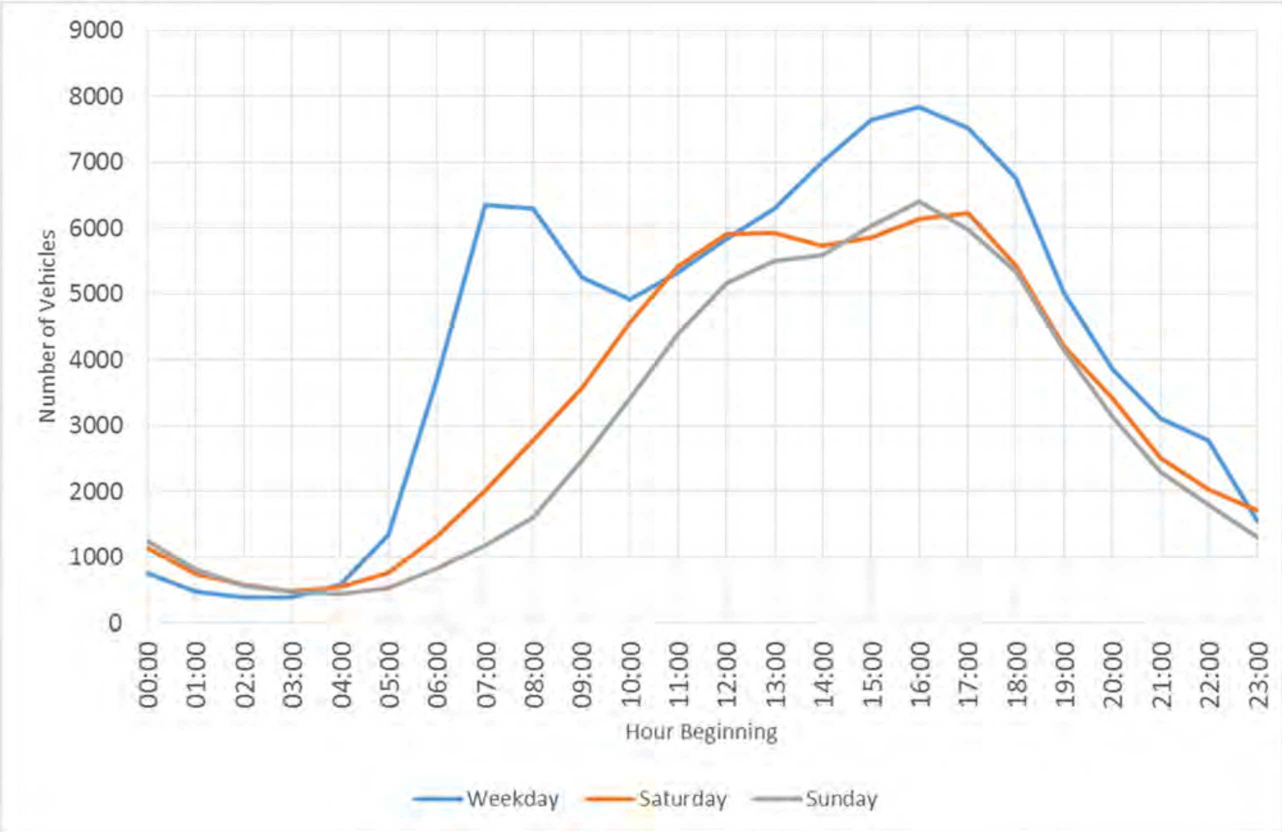
Figure 3.5 – Average Sunday Hourly Traffic Flow into the Junction (2012)



M60 Clockwise

3.20. As queueing on the slip-road from the M62 eastbound to the M60 clockwise has been identified as a cause of delays through the scheme area, Highways England TRADS data has also been interrogated for the M60 clockwise between Junctions 12 and 13, immediately downstream of J12, for the period January – December 2012 to produce **Figure 3.6**. As before, this traffic is the combination of traffic merging from the M62 eastbound, and the competing traffic on the M60.

Figure 3.6 – Average Hourly Traffic Flow for M60 J12-J13 (2012)



3.21. In summary:

- The weekday AM peak, with 6,300 vehicles per hour, is experienced between 07:00 and 09:00. The analysis from the previous section indicates that this is made up of around 2,000 vehicles per hour joining from the M62 eastbound, and the remaining 4,300 from the upstream M60. Following an initial drop, traffic levels rise steadily through the interpeak period to reach a PM peak exceeding 7,500 vehicles per hour between 15:00 and 18:00, which is approaching the capacity of the four-lane carriageway. Of this, around 2,600 vehicles per hour originate from the eastbound M62. This large number of vehicles merging into the motorway at this point is a likely cause of delays on the slip-road from the eastbound M62 and through the M62 J12 Eastbound Diverge;
- On Saturday, traffic flow remains steady between 5,700 and 6,300 vehicles per hour between 12:00 and 18:00, including on average 1,700 vehicles per hour from the M62 eastbound, with a peak hour from 17:00 to 18:00; and
- On Sunday, the peak hour occurs between 16:00 and 17:00, with a flow of 6,400 vehicles per hour, including 2,000 vehicles from the M62 eastbound.

Summary

- Traffic flows before and after the scheme are of a similar volume. There is not sufficient evidence that there has been any change in the volume of traffic on the eastbound approach to Junction 12 between the periods November 2008 – October 2009 and January – December 2012, nor that the scheme has attracted any extra trips to any particular movement;
- Of the three routes possible from the eastbound approach to Junction 12, the movement to the M60 clockwise carries the greatest traffic flow at all times except the weekday AM peak, indicating that this approach is mainly used by strategic traffic wishing to use the M60 to access arterial roads in north Greater Manchester, and for onward access to the M62 and M66 to the east and north. In the AM peak, the movement to the M602 eastbound has a slightly higher flow towards the urban core areas of Salford and Manchester City Centre, which is tidal and hence is likely to be a commuter movement; and
- The flow on the M60 clockwise after J12 is significantly higher in the weekday PM peak than the AM peak and is a likely cause of delays to traffic at the M62 J12 Eastbound Diverge.

4. Journey Time Analysis

Introduction

4.1. As an economy scheme, the key justification for this LNMS is a journey time benefit for road users. The scheme has increased the length of four lane approach to the M62 J12 Eastbound Diverge, and separated traffic heading for the M60 clockwise from that wanting to join the M60 anti-clockwise. These measures were designed to improve journey times for vehicles moving through the junction, especially during peak periods.

4.2. To assess the impact, this report considers evidence from before and after the scheme to ascertain whether there has been a journey time benefit experienced due to the implementation of the M62 J12 Eastbound Diverge LNMS.

Data Source

4.3. For the journey time analysis, Sat Nav data has been used to inform pre- and post-scheme journey times. This data is available from some motorists who use satellite navigation devices and allow their data to be used anonymously for the purpose of generating travel statistics. This data can provide crucial intelligence on the operation of the highway network. The data also has the benefit of being historic, so that it is possible to retrieve pre-scheme journey time data after the scheme has opened.

4.4. In order to conduct the analysis, seven time periods have been defined using the diurnal flow profiles presented in Chapter 3 as a guide. The time periods have been defined to combine similar hours in terms of flow levels and trip purposes (commuting/leisure etc). The seven time periods used are listed in **Table 4.1**.

Table 4.1 – Journey Time Analysis: Time Period Splits

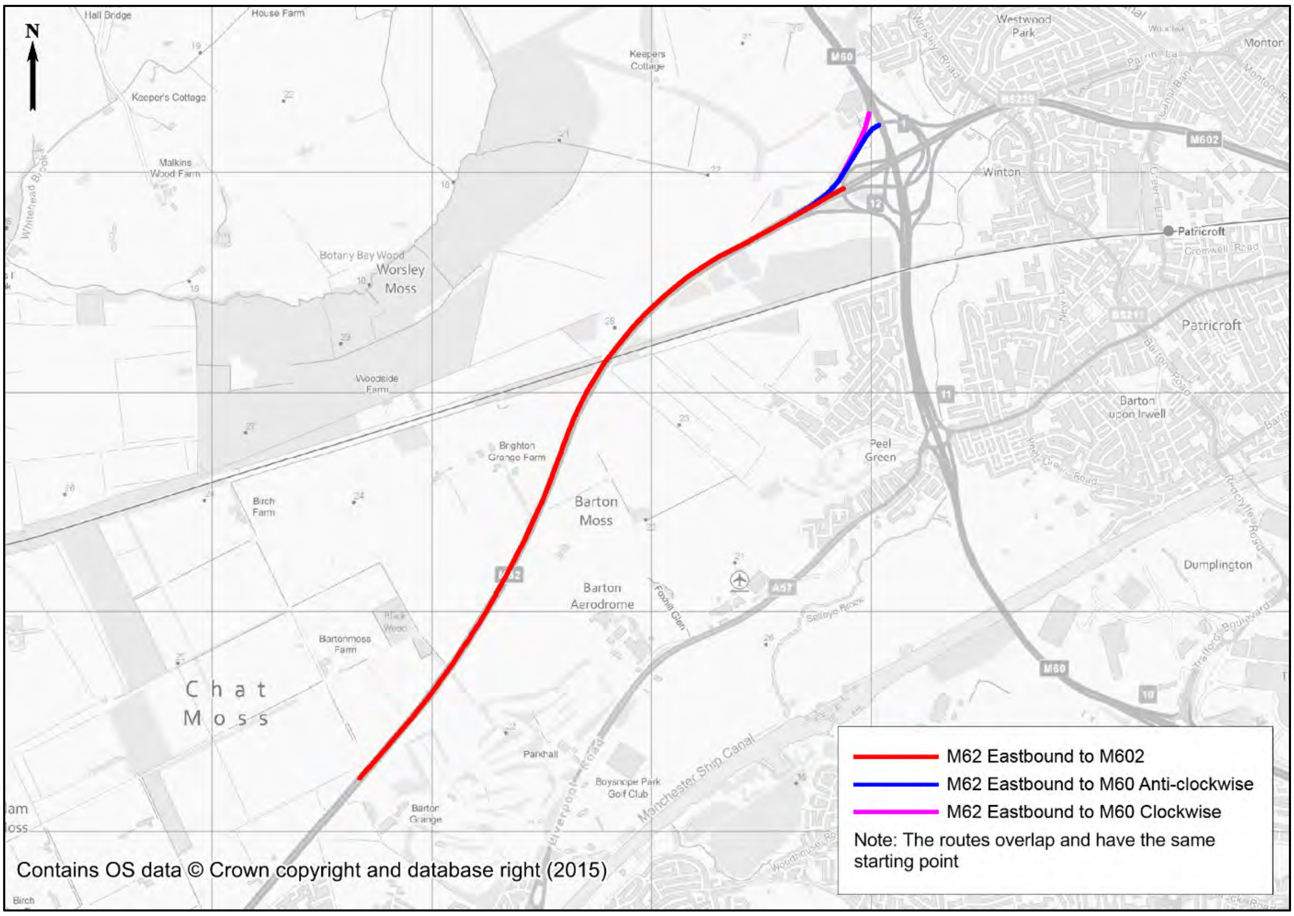
24 Hour Flow	Mon-Fri	Sat	Sun
Weekday AM Peak	07:00 – 09:00		
Weekday AM Shoulder	09:00 – 10:00		
Weekday AM Daytime	10:00 – 14:00		
Weekday PM Shoulders	14:00 – 16:00 18:00 – 19:00		
Weekday PM Peak	16:00 – 18:00		
7-Day Overnight	00:00 – 07:00 19:00 – 00:00	00:00 – 10:00 19:00 – 00:00	00:00 – 11:00 19:00 – 00:00
Weekend Daytime		10:00 – 19:00	11:00 – 19:00

4.5. Sat Nav data has been acquired for these time periods over a one year period before and after the scheme. These periods are defined as:

- Pre-scheme: 1 January 2010 to 31 December 2010; and
- Post-scheme: 1 January 2012 to 31 December 2012.

4.6. The data was collected for three routes, one for each of the three movements at the diverge, shown in **Figure 4.1**. Each route begins approximately 1km upstream of the point where the post-scheme M62 eastbound carriageway widens from three lanes to four, and ends 100-200m after the relevant movement diverges from the others. For each journey time route, data was collected only for vehicles making the full end to end movement and so is a fair reflection of the vehicles making each specific movement at the junction.

Figure 4.1 – Journey Time Routes



Journey Time Comparison

4.7. The impact of the scheme during each of these seven time periods has been considered separately. **Table 4.2** presents the change in journey time between the pre-scheme and post-scheme periods for each movement. Negative values indicate a journey time saving and hence a benefit.

4.8. The analysis shows that the scheme has reduced journey times for each movement in every time period, with the biggest savings for the movement to the M60 anti-clockwise.

Table 4.2 – Difference in Before and After Journey Times (seconds per vehicle)

Destination from M62EB	Wkday AM Pk	Wkday AM Shoulder	Wkday Daytime	Wkday PM Shoulders	Wkday PM Pk	7-Day O/night	Wkend Daytime
M602	-0.8	-4.7	-3.5	-10.9	-33.1	-1.3	-6.0
M60 anti-clockwise	-7.4	-13.4	-10.2	-24.1	-58.8	-5.3	-13.1
M60 clockwise	-6.4	-12.2	-8.1	-12.2	-3.0	-3.3	-8.5

Negative values indicate a journey time saving and hence a benefit. Savings > 20 secs are highlighted in Green.

4.9. The journey time savings shown by the data are in line with the scheme objective of reducing travel times, given in the PAR, with savings achieved across all vehicle movements during all times of the week.

4.10. As traffic destined for the M60 anti-clockwise is no longer required to share the slip-road with the busier movement to the M60 clockwise, vehicles avoid being delayed in traffic queuing along the slip-road. Removing traffic wanting to travel to the anti-clockwise M60 from the two left hand traffic lanes, as well as the lengthening of the four lane section, has also provided additional capacity to assist the M60 clockwise-bound traffic. As a result journey times are shown to be faster through these routes.

4.11. The greatest journey time savings are observed on the movement to the M60 anti-clockwise in the weekday PM peak, with savings of 59 seconds per vehicle. Savings exceeding ten seconds are also observed for this movement in the AM shoulder, weekday daytime, PM shoulder and weekend daytime periods. The savings are consistent with the flow profile of traffic on the M60 clockwise downstream of the junction, shown in **Figure 3.6**, as traffic queuing from that point at busy times is now separated from traffic heading for the M60 anti-clockwise. The savings for the movements to the M60 clockwise are relatively more modest with savings of more than 10 seconds per vehicle only observed during the AM and PM shoulder peaks.

4.12. It is also evident that the ahead movement through to the M602 has improved following the completion of the scheme with savings identified during all time periods. These improvements are likely to have resulted from the lengthening of the four lane approach to the junction which means that delays are now less likely to block back and affect the mainline conditions on the right hand traffic lanes, which are signed for the ahead M602 movement. The greatest improvement is during the PM peak period when a saving of 33 seconds per vehicle is observed, with PM shoulder peak benefits of more than 10 seconds also observed.

4.13. Whilst **Table 4.2** presents the change in journey times, the actual before and after journey times observed in the Sat Nav data are presented in **Appendix A** and **Appendix B** respectively.

Journey Time Reliability

4.14. The Sat Nav data also allows any change in journey time reliability to be quantified, by using the inter-quartile range journey times and the 5th to 95th percentile journey times. By considering how these ranges have changed from the pre-scheme year to the post-scheme year the reliability of journey times can be assessed.

4.15. The length of the routes analysed for journey time reliability differ slightly from those analysed for journey time comparison, resulting in a slight difference in the mean journey times presented in the two different analyses.

4.16. The graphs presented in **Appendix C** show the journey time reliability on the three vehicle movements assessed:

- M62 eastbound to M602;
- M62 eastbound to M60 anti-clockwise; and
- M62 eastbound to M60 clockwise.

4.17. In summary, the reliability graphs show:

- The movement to the M602 shows improvements in the PM peak, when 75% of journeys are completed in under 156 seconds after the scheme, compared to 203 seconds before the scheme, and where the interquartile range of journey times has decreased from 70 seconds to 33 seconds with the scheme. There are also smaller improvements in all other time periods;
- The movement to the M60 anti-clockwise shows improvements in the PM shoulder, when 75% of journeys are completed in under 213 seconds, compared to 304 seconds before the scheme and where the interquartile range of journey times has decreased from 115 seconds to 42 seconds with the scheme. There are also smaller improvements in all other time periods; and
- The movement to the M60 clockwise shows an improvement to the 75th percentile journey time and interquartile range of journey times in all time periods, the largest of which is the PM peak, when 75% of journeys are completed in under 257 seconds after the scheme, compared to 279 seconds before the scheme, and where the interquartile range of journey times has decreased from 112 seconds to 103 seconds with the scheme. Although the 95th percentile journey time in the PM peak, for this movement only, has increased following the scheme, it can be argued that this increase in worst-case journey time is not the result of the scheme, given that delays to this movement are attributed to congestion caused by high traffic volumes on the M60 clockwise.

4.18. The observation of the largest journey time reliability improvements in the PM peak, is consistent with the attribution of delays at the diverge to queuing traffic attempting to merge on to the M60 clockwise, which is close to capacity in the PM peak. The largest reliability improvements are observed for traffic heading for the M60 anti-clockwise. This is the movement that has been separated from traffic for the M60 clockwise for the greatest distance following the scheme.

Calculation of Annual Vehicle Hour Benefits

4.19. **Table 4.2**, presented earlier in this section, demonstrates how journey times have changed for certain movements and time periods before and after the scheme's construction. It is assumed that these changes are a result of the scheme measures. Therefore, it is necessary to calculate the number of vehicle hours saved in the opening year, in order to understand and quantify the overall impact for this evaluation.

4.20. Post-scheme traffic volumes for the three movements have been identified using January-December 2012 data from TRADS sites. The comparison of pre- and post-scheme flows in **Table 3.2** indicates there has been no increase in traffic, so there is no requirement to include a rule of half adjustment to the vehicle hour savings[1].

4.21. Average weekly vehicle movement flows are presented in **Table 4.3**. These present the total vehicle movements in each time period across the average week.

Table 4.3 – Total Weekly Vehicle Flow by Period

Destination from M62EB	Wkday AM Pk	Wkday AM Shoulder	Wkday Daytime	Wkday PM Shoulders	Wkday PM Pk	7-Day O/night	Wkend Daytime
M602	21,931	7,037	17,845	12,516	9,693	22,557	11,363
M60 anti-clockwise	8,656	3,436	12,854	11,246	10,424	12,776	9,766
M60 clockwise	19,935	9,550	38,727	34,394	26,635	50,568	29,571
Total	**50,522**	**20,023**	**69,426**	**58,156**	**46,752**	**85,901**	**50,700**

4.22. The vehicle movements outlined in **Table 4.3** are multiplied by the differences in journey times outlined in **Table 4.2** to identify the total weekly vehicle hour savings.

4.23. Weekly vehicle hour savings are multiplied by 52 to calculate the annual vehicle hour savings. The annual resulting vehicle hour savings are summarised in **Table 4.4**.

[1] Note that Rule of Half (RoH) is triggered when the flow increases by over 10%. On these occasions we can be confident that the flow difference is related to the scheme and not just traffic survey errors. Under the rule of half, the existing traffic experiences the full benefit, whereas the additional traffic volume only experiences half of the benefit.

Table 4.4 – Annual Vehicle Hour Savings, by Approach Arm

Destination from M62EB	Wkday AM Pk	Wkday AM Shoulder	Wkday Daytime	Wkday PM Shoulders	Wkday PM Pk	7-Day O/night	Wkend Daytime	Total	% of Total
M602	-243	-482	-913	-1,968	-4,641	-424	-980	**-9,650**	19.3%
M60 anti-clockwise	-923	-667	-1,889	-3,909	-8,856	-969	-1,849	**-19,062**	38.1%
M60 clockwise	-1,833	-1,682	-4,547	-6,050	-1,160	-2,376	-3,647	**-21,295**	42.6%
Total	**-2,999**	**-2,831**	**-7,348**	**-11,927**	**-14,657**	**-3,769**	**-6,476**	**-50,006**	**100.0%**
% of Total	6.0%	5.7%	14.7%	23.9%	29.3%	7.5%	12.9%	**100.0%**	

Negative values indicate a journey time saving and hence a benefit. These are highlighted in Green.

4.24. **Table 4.4** demonstrates:

- Overall, the scheme has resulted in a decrease in journey times through the junction, producing 50,006 vehicle hours of journey time benefits in the opening year, with benefits for every movement considered in every time period;
- The movement experiencing the greatest benefit is the movement from the M62 eastbound to the M60 clockwise, with savings of 21,295 vehicle hours per annum;
- Although the movement to the M60 anti-clockwise had higher time savings per vehicle, its smaller flow means the benefit for this movement is slightly less, at 19,062 vehicle hours per annum;
- The movement to the M602 also experiences benefits, with savings of 9,650 vehicle hours per annum; and
- The period with the largest annual vehicle hour savings is weekday PM peak, with 14,657 vehicle hours saved. There are also savings during the weekday PM shoulder period, with 11,927 vehicle hours saved per annum. Together these two periods, when the M60 clockwise downstream of the junction reaches its highest flow, make up over 50% of the total journey time benefits.

4.25. **Table 4.5** presents a breakdown of the annual journey time savings, by the scale of the journey time impacts.

Table 4.5 – Annual Vehicle Hour Savings, by Size of Impact

Change in JT (Secs per Veh)	Journey Time Benefits	Journey Time Dis-Benefits	Total Journey Time Impact
0 – 10	-18,496	0	**-18,496**
10 – 20	-14,105	0	**-14,105**
20+	-17,406	0	**-17,406**
Total	**-50,006**	**0**	**-50,006**

4.26. It can be seen from **Table 4.5** that 17,406 of the annual vehicle hours saved, over one third of the total of 50,006, are achieved as a result of large journey time improvements for individual movements. This gives confidence that the scheme has had an impact on journey times in real terms and that the benefit is not entirely attributable to small changes in journey time.

4.27. The evidence presented shows that the scheme has been successful in reducing journey times. This conclusion is drawn from considering all time periods throughout the week.

Summary

- The scheme has met its objective of reducing journey times through the diverge part of the junction, and has resulted in 50,006 vehicle hours saved in the opening year with benefits for every movement considered in every time period;
- Each of the three movements has reduced journey times following the scheme, with the largest amount of benefits coming from movements to the M60 clockwise and anti-clockwise;
- Over 50% of journey time benefits are experienced during the weekday PM shoulders and weekday PM peak, which together make up the period 14:00-19:00; and
- Journey time reliability is improved in all time periods for all routes through the diverge, with the greatest improvements in the PM peak. The movement to the M60 anti-clockwise experiences the largest reliability improvements.

5. Safety Impacts

Introduction

5.1. A critical component of any highway scheme is safety. This scheme aimed to reduce the number of accidents occurring at the junction, particularly those involving shunts. This section examines the safety impacts associated with the scheme, and compares the pre- and post- scheme opening accident rates to determine whether the scheme has resulted in a post opening safety benefit or dis-benefit.

Data Source

5.2. The PAR used accidents[2] from the five year period 2003-2007 as evidence for the pre-scheme conditions at the scheme site. The PAR stated that there had been 45 accidents during this period and that the scheme aimed to save 2.0 accidents in the opening year. The area over which accidents are considered is highlighted in **Figure 5.1**.

5.3. The PAR covers the evidence used to support the decision to proceed with the scheme, effectively outlining the business case. However, once a PAR has been completed and agreed, there can be a time delay before the start of scheme construction.

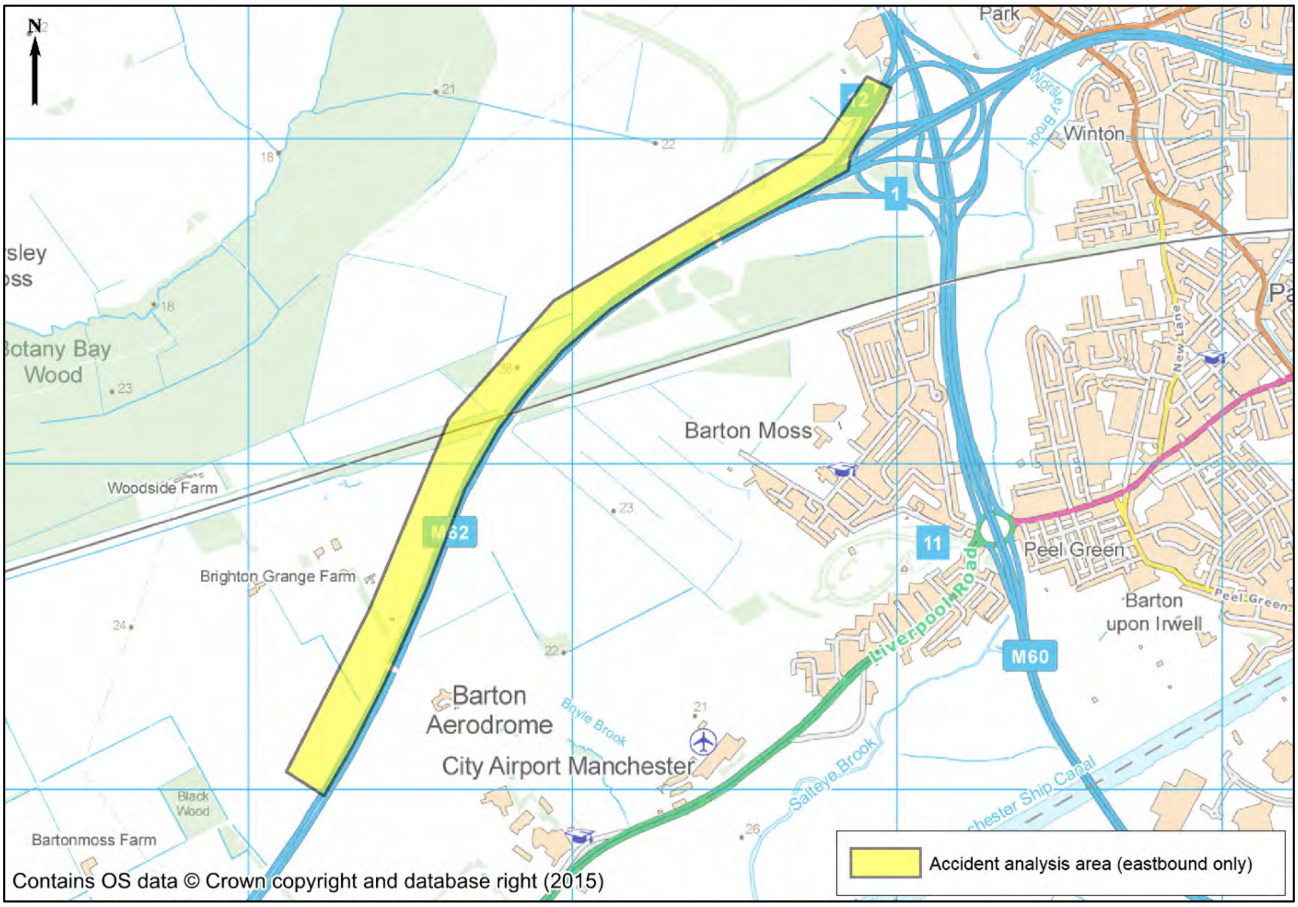
5.4. The delay between collecting evidence for a scheme and starting construction means the accident data used to evidence the situation before the scheme is often dated. As such, to understand just the impact of the scheme, a five year pre-construction accident analysis represents a better comparison to the outturn accident rate, and hence representation of scheme impacts.

5.5. For this scheme, the PAR used accident data up until 2007. However, scheme construction did not begin until 2011. Therefore, there are 36 months between the evidence and the scheme, during which time the accident rate could have changed.

5.6. As such, to understand just the impact of the scheme, accident data has been analysed for the same location for 2006-2010, a period of five years directly before construction began.

[2] All references to accidents in this report refer to Personal Injury Collisions (PICs).

Figure 5.1 – Accident Analysis Area



5.7. The results are presented in **Table 5.1**, which show that 35 accidents occurred during this pre-scheme opening period (average of 7 per year), with three serious accidents and the remainder slight. The predicted opening year accident saving remains 2.0, as given in the PAR.

Table 5.1 – 5 Year Pre-Scheme Accident Rates

Accidents	Dates	Slight	Serious	Fatal	Rate	Severity Index
5yr Pre-Construction	Jan 2006 – Dec 2010	32	3	0	7.00	8.6%

Construction

5.8. It is important to consider the effect of construction on accidents. While this is not typically monetised in LNMS evaluations, it is informative to consider whether the construction process introduces accidents to the road network.

5.9. For the M62 J12 Eastbound Diverge scheme, the construction period was between the first quarter of 2011 and the middle of September 2011. During this period, there were seven accidents recorded in the area affected by the scheme, two of which were serious and the remainder slight.

5.10. Data on the accidents shows that three of the slight accidents, and no serious accidents, occurred in the vicinity of roadworks. However, it is unclear from the data considered whether the roadworks were a contributory factor.

Post-Scheme

5.11. To understand the safety performance of the road network after the scheme implementation, data has been collected for the period since the scheme opened. The scheme opened in September 2011 and data has been collected from the following month until June 2014. Data since July 2014 was not deemed suitable for analysis, as vehicles using the slip-roads to the M60 are likely to be affected by roadworks for the M60 Smart Motorway project and the associated reduction in speed limit. There are therefore 33 months of post-opening data to interrogate for this scheme.

5.12. The accident data provided is outlined in **Table 5.2**.

Table 5.2 – Post-Scheme Accident Summary

Accidents	Dates	Slight	Serious	Fatal	Rate	Severity Index
Post-Scheme	Oct 2011 – Jun 2014	9	0	0	3.27	0.0%

5.13. The table demonstrates that there have been nine personal injury accidents since the scheme opened, all of which were recorded with slight severity. One of these occurred on the slip-road from the M62 to the M60 clockwise and anti-clockwise, two occurred on the M62 approach to the junction after the start of 'tiger tail' markings, and the remaining six occurred upstream within the length of the scheme. The post-scheme accident rate is 3.27 accidents per annum, a significant reduction on the five year pre-scheme accident rate as well as the pre-scheme rate reported in the PAR.

Accident Rate Change

5.14. The key changes in accidents that can result from a scheme are:

- Change in the frequency of accidents; and
- Change in the severity of accidents.

5.15. By understanding the impact the scheme has had on these metrics, it is possible to draw conclusions on the safety aspects of the M62 J12 Eastbound diverge scheme.

5.16. **Table 5.3** shows the accident rate and severity index for the pre-construction and post-scheme periods.

Table 5.3 – Impact of Scheme on Accident Rates

5yr Pre-Construction Period		Post-Scheme Period		Accident Saving
Accident Rate	Severity Index	Accident Rate	Severity Index	
7.00	8.6%	3.27	0.0%	3.73

5.17. The table shows that the scheme has reduced the accident rate by 3.73 accidents per year. This is substantially greater than the forecast saving of 2.00 accidents per annum which was stated in the PAR.

5.18. The post-scheme severity index of 0.0% (i.e. no serious or fatal accidents) indicates that the scheme has also improved the area's severity index.

Accident Causation

5.19. DfT accident data provides a comprehensive record of the accidents that have occurred. This allows us to go beyond the frequency and severity of accidents and consider further attributes of the accidents. It is possible to consider the scheme's impact on both the vehicle movements which lead to accidents and the external objects recorded to be hit during accidents. External objects do not include other moving vehicles.

5.20. **Table 5.4** and **Table 5.5** demonstrate the before and after frequency of vehicle movements and external objects hit respectively. In the outturn column of these tables, savings above 0.2 accidents per annum are highlighted in green, increases above 0.2 accidents per annum are highlighted in red, while changes of 0.2 accidents per annum or less are highlighted in amber.

Table 5.4 – Impact on Vehicle Movements leading to Accidents per Annum

Movement	5 Year Pre-Construction	Outturn
Slowing or stopping	4.80	0.36
Waiting to go but held up	2.20	0.36
Parked	0.20	0.00
Subtotal: Shunts	7.20	0.73
Changing lane to left	0.80	0.00
Changing lane to right	0.60	0.73
Subtotal: Lane changes	1.40	0.73
Going ahead	8.80	5.82
Moving off	0.20	0.00
Overtaking moving vehicle	0.20	0.00
Subtotal: Other	9.20	5.82

Table 5.5 – Impact on External Objects Hit by Vehicles in Accidents per Annum

Object Hit	5 Year Pre-Construction	Outturn
Central barrier	0.60	0.36
Bollard or refuge	0.40	0.00
Nearside barrier	0.20	1.45
Parked vehicle	0.20	0.00
Road sign or traffic signal	0.20	0.00
Kerb	0.00	0.73
Total	1.60	2.55

5.21. As the scheme has resulted in a reduction in accidents, there is also a large reduction in particular vehicle movements.

5.22. The scheme PAR specifically made reference to a problem with shunt type and lane change accidents at the junction. **Table 5.4** shows that that the annual rate of parked, held up or slowing vehicles involved in accidents at the junction has decreased from 7.20 before the scheme to 0.73 after the scheme, suggesting that the scheme has successfully addressed shunt type accidents.

5.23. The annual rate of vehicles involved in accidents when changing lane has decreased from 1.40 before the scheme to 0.73 after the scheme, suggesting the scheme has also successfully reduced lane change accidents.

5.24. However, **Table 5.5** shows that there has been an increase in overall external objects hit, from 1.60 to 2.55 per annum. This increase is mainly attributed to an increase in vehicles hitting the nearside barrier from 0.20 to 1.45 per annum. Part of the scheme involved the conversion of lengths of the hard shoulder to a live running lane, increasing the proximity of fast-moving vehicles to the nearside barrier, which could explain the increase in vehicles hitting the barrier.

Summary

- The scheme has succeeded in its safety objective, with a reduction of 3.73 accidents per annum, when compared to the five years prior to the scheme being constructed;
- There have been nine accidents to occur following the scheme opening during the period between October 2011 and June 2014, one of which occurred on the slip-road from the M62 to the M60 clockwise and anti-clockwise, two of which occurred on the M62 approach to the junction after the start of 'tiger-tail' markings, and the remaining six of which occurred upstream within the length of the scheme;
- Accident severity index (proportion of KSI) has reduced from 8.6% to 0.0% with no serious or fatal accidents occurring following the scheme opening during the period between October 2011 and June 2014; and
- The scheme has been followed by a notable reduction in shunt type and lane changing accidents.

6. Economy

Introduction

6.1. This section of the report takes the journey time and safety impacts reported in Chapters 4 and 5, and considers the monetary value of these impacts. These monetised benefits are then compared to the cost of scheme construction to inform two measures of value for money:

- **First Year Rate of Return (FYRR):** This is a measure of the scheme's first year benefits as a proportion of the scheme cost. It is given as a percentage and informs the percentage of the scheme costs recouped in the opening year. The FYRR given is evidence based and a primary finding of this report; and
- **Benefit Cost Ratio (BCR):** This is a measure of all the benefits that the scheme is likely to accrue over its workable life divided by the scheme cost over its life. This can only be a prediction, as this is a one year after opening report and it is not known how the scheme will perform in the future. However, this forecast is revised from that provided in the PAR based on the first year evidence.

6.2. All monetised figures in this section are quoted in 2002 prices, discounted to opening year, unless otherwise specified.

PAR and Outturn Comparison

6.3. The evidence provided in this report has been analysed to evaluate the scheme costs and economic benefits of the scheme provided in the PAR and to calculate the outturn costs and scheme benefits.

6.4. The benefits calculated and discussed in this report can be monetised using standard value of time and accident values from WebTAG. A positive impact is considered to provide a monetary saving. Once monetised in this way, the economy and safety impacts of the scheme are offset against the scheme costs to inform the overall Value for Money of the scheme package in both an opening year, and over a longer scheme life period of 60 years.

6.5. **Table 6.1** summarises this comparison, presenting the PAR and outturn costs and benefits of the scheme. It also includes opening year and scheme life figures for both costs and benefits of the scheme.

Table 6.1 – PAR and Outturn Economy Comparison

		PAR	Outturn
Opening Year (2011)	Total Cost	£3.462m	£5.104m
	Opening Year Accident Saving (number)	2.0	3.7
	Opening Year Accident Saving (£)	£0.168m	£0.312m
	Opening Year Journey Time Benefits (£)	£1.003m	£0.661m
	FYRR	34%	19%
Scheme Life (60 years)	Costs	£3.462m	£5.104m
	Safety Benefits	£9.717m	£18.110m
	Journey Time Benefits	£40.829m	£26.916m
	BCR	14.6	8.8

Summary

6.6. Overall the scheme is shown to have been less successful than was predicted. However, it has still resulted in an overall beneficial impact.

6.7. It was anticipated that the scheme would deliver a large journey time saving, as well as preventing some of the accidents that were occurring at the junction. Overall the benefits were expected to be distributed 80% economy and 20% safety.

6.8. The Sat Nav data has provided evidence that journey times to move through the scheme area have decreased, but the resulting benefit is two thirds of that predicted in the PAR, with an outturn benefit of £0.661m per annum. No further details of the calculation of the journey time benefits predicted in the PAR were supplied by the ASC.

6.9. The scheme has saved considerably more accidents than were forecast, which partially offsets the shortfall in journey time benefits. Whilst it was anticipated that 2.0 accidents per annum would be prevented, the actual saving has been 3.7 accidents per annum. As a result, the economic safety benefits are more than predicted, at £0.312m per annum once monetised.

6.10. The outturn scheme costs were almost 50% higher than those predicted in the PAR evaluation.

6.11. Despite the increase in accidents saved compared to the PAR prediction, the increased costs and decreased journey time savings affect the Value for Money. The outturn FYRR and BCR are lower than those forecast in the PAR. However, a 60 year BCR of 8.8 is still significant and indicative of a successful scheme which represents good value for money.

7. Other Impacts

7.1. This section of the report presents information relating to the NATA objectives which are not related to journey times, reliability or safety, as set out in the PAR's AST (as these have already been discussed in previous chapters).

7.2. This information will be compared to the forecasts made in the AST (provided in **Appendix D**). These comparisons are used to score the scheme against NATA objectives based on the first year's observed findings and are recorded in the Evaluation Summary Table (EST). The EST can be found in **Appendix E**.

7.3. Those impacts which are not detailed below have all been assessed as 'not applicable'.

Journey Ambience

7.4. The scheme's PAR considered that the scheme would have a moderate beneficial impact on journey ambience, reducing traveller stress as a result of improvements to driver frustration, fear of potential accidents and route uncertainty.

7.5. By improving journey times and reducing congestion, as confirmed by the Sat Nav data analysed in **Chapter 4**, the new road layout reduces driver frustration. The fear of potential accidents reduced, as the analysis in **Chapter 5** indicates that the scheme has resulted in a reduction in accident rates, especially shunt type accidents. Route uncertainty is reduced through the introduction of earlier advanced signage giving information on the lane allocation at the junction.

7.6. As a result of these effect, which reduce driver stress, an overall **moderate beneficial** impact in terms of journey ambience is recorded in the EST for the scheme.

Landscape

7.7. As the scheme involved the erection of additional overhead gantry signage, which adds to visual intrusion across the landscape, a **slight adverse** impact is recorded for this sub-objective.

Physical Fitness

7.8. The scheme has no impact on physical fitness so the EST includes a 'Neutral' score for this sub-objective.

Severance

7.9. The scheme has no impact on severance so the EST includes a 'Neutral' score for this sub-objective.

Noise

7.10. Although there are a small number of homes within 300m of the scheme, the traffic volume analysis in **Chapter 3** shows that there has been no significant change in traffic volumes travelling through the M62 J12 Eastbound Diverge since the scheme was installed. Furthermore, the journey time data extracted for the analysis in **Chapter 4** indicates that average speeds through the scheme area did not change by more than 10kph in any of the time periods considered. Although there are other factors to be considered in a full noise assessment, this data provides an indication that noise levels have not changed significantly. Therefore, the EST includes a ‘Neutral’ impact for noise.

Air Quality

7.11. Although one home lies within 50m of the scheme, there has been no significant change in traffic volumes using the M62 J12 Eastbound Diverge, and the journey time data extracted for the analysis in **Chapter 4** indicates that overall average speeds through the scheme area have not changed by more than 5kph. Although there are other factors to be considered in a full air quality assessment, this data provides an indication that there has been no significant change in air quality. A ‘Neutral’ impact is therefore recorded for this sub-objective.

Greenhouse Gases

7.12. The total distance travelled by traffic has not changed significantly following the scheme so the EST includes a ‘Neutral’ impact for this sub-objective.

Heritage of Historic Resources

7.13. The scheme has no impact on archaeological or build heritage sites so the EST includes a ‘Neutral’ score for this sub-objective.

Biodiversity

7.14. The scheme has no impact on biodiversity so the EST includes a ‘Neutral’ score for this sub-objective.

Water Environment

7.15. The scheme has no impact on highway drainage or discharge so the EST includes a ‘Neutral’ score for this sub-objective.

Security

7.16. The scheme has no impact on the indicators of security so the EST includes a ‘Neutral’ score for this sub-objective.

8. Conclusions and Recommendations

8.1. This report presents the POPE of the M62 J12 Eastbound Diverge LNMS, implemented by the Area 10 MAC in 2011. The scheme evaluation has considered all elements of the NATA criteria. The evaluation team have worked closely with the ASC to ensure the best data possible was used and the scheme thoroughly understood.

8.2. The purpose of this section is to:

- Summarise the key impacts of the scheme and how these compare to forecasts; and
- Consider the lessons learnt and make recommendations to improve future LNMS.

8.3. The M62 J12 Eastbound Diverge LNMS opened in September 2011. The scheme increased the length of four lane approach to the M62 J12 Eastbound Diverge by converting the hard shoulder to a running lane, and separated traffic heading for the M60 clockwise from that for the M60 anti-clockwise through altered signage and road markings.

8.4. The journey time analysis identified that the scheme was successful in reducing journey times, with an annual benefit identified, mostly experienced by traffic heading for the M60 clockwise and anti-clockwise. However, this benefit was only two thirds of the forecast journey time benefit.

8.5. Although presented as an economy scheme, there was also anticipated to be an accident reduction owing to the scheme. The evidence shows the accident savings that have been achieved are greater than those forecast, resulting in a higher than anticipated economic benefit.

8.6. Combining the journey time and accident benefits, the scheme performs positively with an outturn FYRR of 19% and a BCR of 8.8. Although these results are lower than was forecast in the PAR, they still indicate that the M62 J12 Eastbound Diverge LNMS has been a successful scheme.

Scheme Specific Objectives

8.7. Drawing on information presented in this report, a summary of the scheme’s success against the scheme specific objectives, listed in the introduction to this report, is provided in **Table 8.1**.

Table 8.1 – Scheme Specific Objectives

Objective	Evaluation Summary	
Economy: Reducing congestion and travel times	The scheme has resulted in a reduction in journey times with a saving of 50,006 vehicle hours in the opening year.	✓
Safety: Reducing accidents	The scheme has had a significant impact in reducing accidents, with the annual accident rate falling from 7.00 in the five year pre-constriction period to 3.27 after the introduction of the scheme.	✓

Lessons Learned

8.8. During the course of this evaluation, the findings have revealed one way in which the LNMS appraisal process could be adapted to improve the accuracy of pre-scheme forecasting. As an economy scheme, the predicted benefits of this scheme were predominantly expected to arise from journey time savings. However, the outturn journey time benefits were two thirds of the benefits predicted in the PAR, resulting in a much lower than predicted BCR. The PAR gave no details of the methodology supporting the journey time benefit prediction. The inclusion of such details would be beneficial in order to evaluate the suitability of the prediction.

Appendices

Appendix A. Pre-Scheme Journey Times

Destination	Wkday AM Pk	Wkday AM Shoulder	Wkday Daytime	Wkday PM Shoulders	Wkday PM Pk	7-Day O/night	Wkend Daytime	Simple Average
M602	135.3	130.5	126.7	141.1	179.6	122.1	123.9	137.0
M60 anti-clockwise	166.2	165.3	159.4	182.2	247.2	150.2	156.3	175.3
M60 clockwise	169.9	169.1	162.1	185.7	254.1	149.6	154.6	177.9
Total	471.5	464.9	448.2	509.0	681.0	422.0	434.8	471.5

Journey times are given in seconds

Note: The average value is a simple average, and is not weighted by volume of traffic

Appendix B. Post-Scheme Journey Times

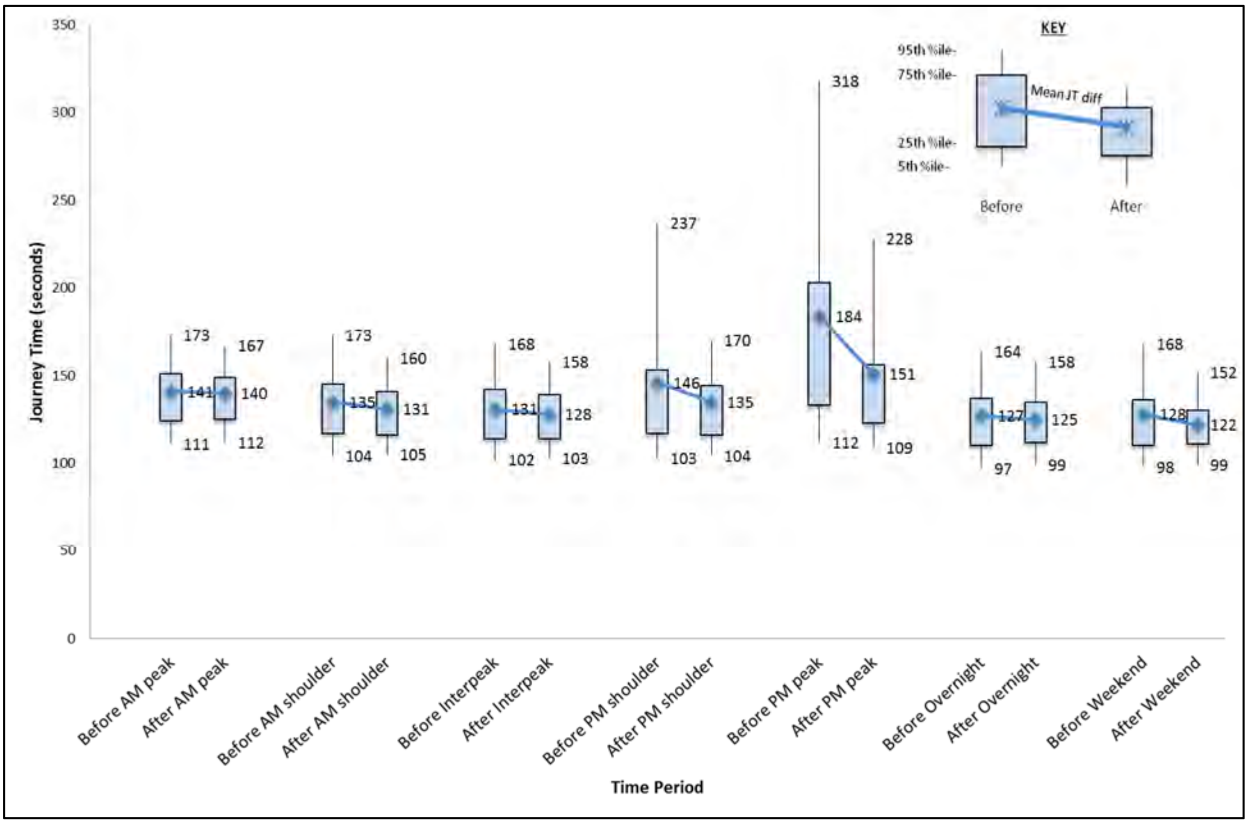
Destination	Wkday AM Pk	Wkday AM Shoulder	Wkday Daytime	Wkday PM Shoulders	Wkday PM Pk	7-Day O/night	Wkend Daytime	Simple Average
M602	135	126	123	130	147	121	118	128
M60 anti-clockwise	159	152	149	158	189	145	143	156
M60 clockwise	164	157	154	174	251	146	146	170
Total	457	435	426	462	586	412	407	457

Journey times are given in seconds

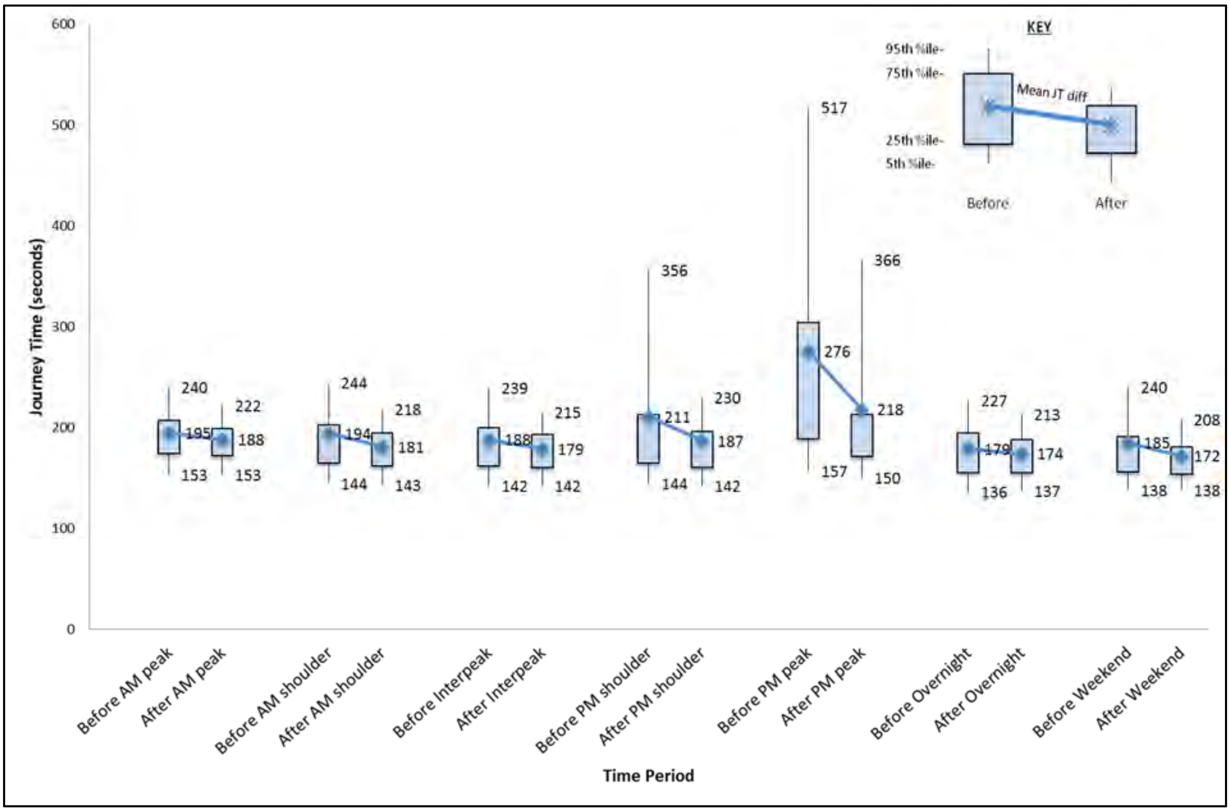
Note: The average value is a simple average, and is not weighted by volume of traffic

Appendix C. Journey Time Reliability Comparison Graphs

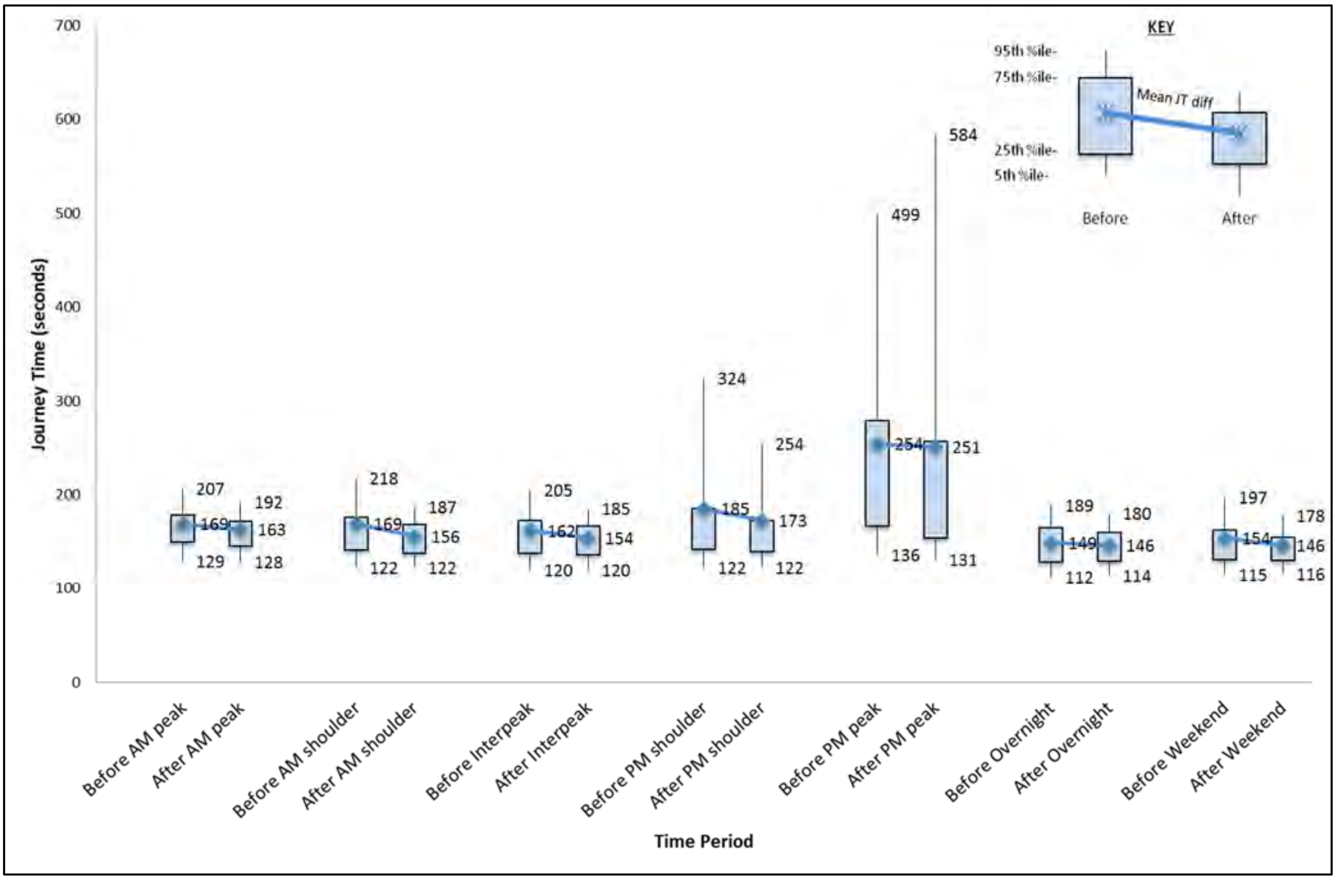
M62 Eastbound to M602



M62 Eastbound to M60 Anti-clockwise



M62 Eastbound to M60 Clockwise



Appendix D. Appraisal Summary Table (AST)

	Sub-Objective	Qualitative Impact	Quantitative Measures	Assessment
ENVIRONMENT	Noise	Not applicable	Not applicable	Not applicable
	Local Air Quality	Not applicable	Not applicable	Not applicable
	Greenhouse Gases	Decrease in number of vehicles in congestion and decrease in time spent in traffic queues will result in less greenhouse gas emissions from vehicles	Decrease	Beneficial
	Landscape	Not applicable	-	Not applicable
	Townscape	Not applicable	-	Not applicable
	Heritage and Historical Resources	Not applicable	-	Not applicable
	Biodiversity	Not applicable	-	Not applicable
	Water Environment	Not applicable	-	Not applicable
	Physical Fitness	Not applicable	Not applicable	Not applicable
	Journey Ambience	Reducing congestion will reduce driver frustration. Reducing lane change conflicts will reduce the fear of potential accidents. Better signing and lane allocation will reduce driver uncertainty. Reduced environmental impacts due to less congestion	-	Moderate beneficial
SAFETY	Accidents	Supporting calculations presented in PAR	126 accidents saved over 60 years	£9.717m Accident PVB
	Security	Not applicable	Not applicable	Not applicable
ECONOMY	Public Accounts	Not applicable	Not applicable	Not applicable
	All Users	None	Supporting calculations presented in PAR	£40.829m All Users+Providers PVB £0.000m Incident Delay PVB £40.829m Combined PVB
	Reliability	DDV: Increased capacity for M60 Clockwise traffic, dedicated lane provision for M60 Anticlockwise traffic providing a free flow lane for M60 Anticlockwise and M602 Eastbound Traffic. IRV: More traffic lanes for vehicles to move around any accidents. Providing emergency refuges. Improved monitoring of traffic will allow earlier incident information to be relayed to the travelling public	DDV: See calcs. With the provision of an additional lane for M60 Clockwise traffic ensures capacity is achieved for the majority of the day. IRV: There are 74 damage only accidents reported within 1.7yrs of commission. Estimated saving of 25% of accidents per year	DDV: Moderate Beneficial IRV: Slight Beneficial
	Wider Economic Impacts	Not applicable	Not applicable	Not applicable
ACCESSIBILITY	Option values	Not applicable	-	Not applicable
	Severance	Not applicable	Not applicable	Not applicable
	Access to Transport System	Not applicable	-	Not applicable
INTEGRATION	Transport Interchange	Not applicable	Not applicable	Not applicable
	Land Use Policy	Not applicable	-	Not applicable
	Other Government Policies	Not applicable	-	Not applicable

Appendix E. Evaluation Summary Table (EST)

	Sub-Objective	Qualitative Impact	Quantitative Measures	Assessment
ENVIRONMENT	Noise	Based on a lack of change in traffic volumes, it is considered that the changes in noise are not significant	-	Neutral
	Local Air Quality	Based on a lack of change in traffic volumes, it is considered that the changes in air quality are not significant	-	Neutral
	Greenhouse Gases	No significant change in the total distance travelled by traffic	-	Neutral
	Landscape	Addition of extra overhead gantry signage leads to some visual intrusion	-	Slight adverse
	Townscape	Not applicable as the scheme is situated in a rural area	-	Not applicable
	Heritage and Historical Resources	Scheme does not impact any archaeological or heritage site	-	Neutral
	Biodiversity	Scheme does not impact biodiversity	-	Neutral
	Water Environment	Scheme does not impact water environment	-	Neutral
	Physical Fitness	Scheme does not impact physical fitness	-	Neutral
	Journey Ambience	Driver frustration is reduced by the reduction in congestion. Fear of potential accidents is reduced as a result of a lower accident rate. Driver uncertainty is reduced by new signage and lane allocation	-	Beneficial
SAFETY	Accidents	Scheme reduces accident rate	234 accidents saved over 60 years	£18.110m Accident PVB
	Security	Improved monitoring of nearside lane	-	Slight beneficial
ECONOMY	Public Accounts	PVC calculated within the evaluation	Outturn cost: £5.104m	Outturn PVC: £5.104m
	All Users	PVB calculated within the evaluation	Outturn benefit: £26.916m	Outturn PVB: £26.916m
	Reliability	Improvement as per earlier analysis of journey time information	-	Beneficial
	Wider Economic Impacts	Not applicable	-	Not applicable
ACCESSIBILITY	Option values	Not applicable	-	Not applicable
	Severance	Scheme does not impact severance	-	Neutral
	Access to Transport System	Not applicable	-	Not applicable
INTEGRATION	Transport Interchange	Not applicable	-	Not applicable
	Land Use Policy	Not applicable	-	Not applicable
	Other Government Policies	Not applicable	-	Not applicable

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